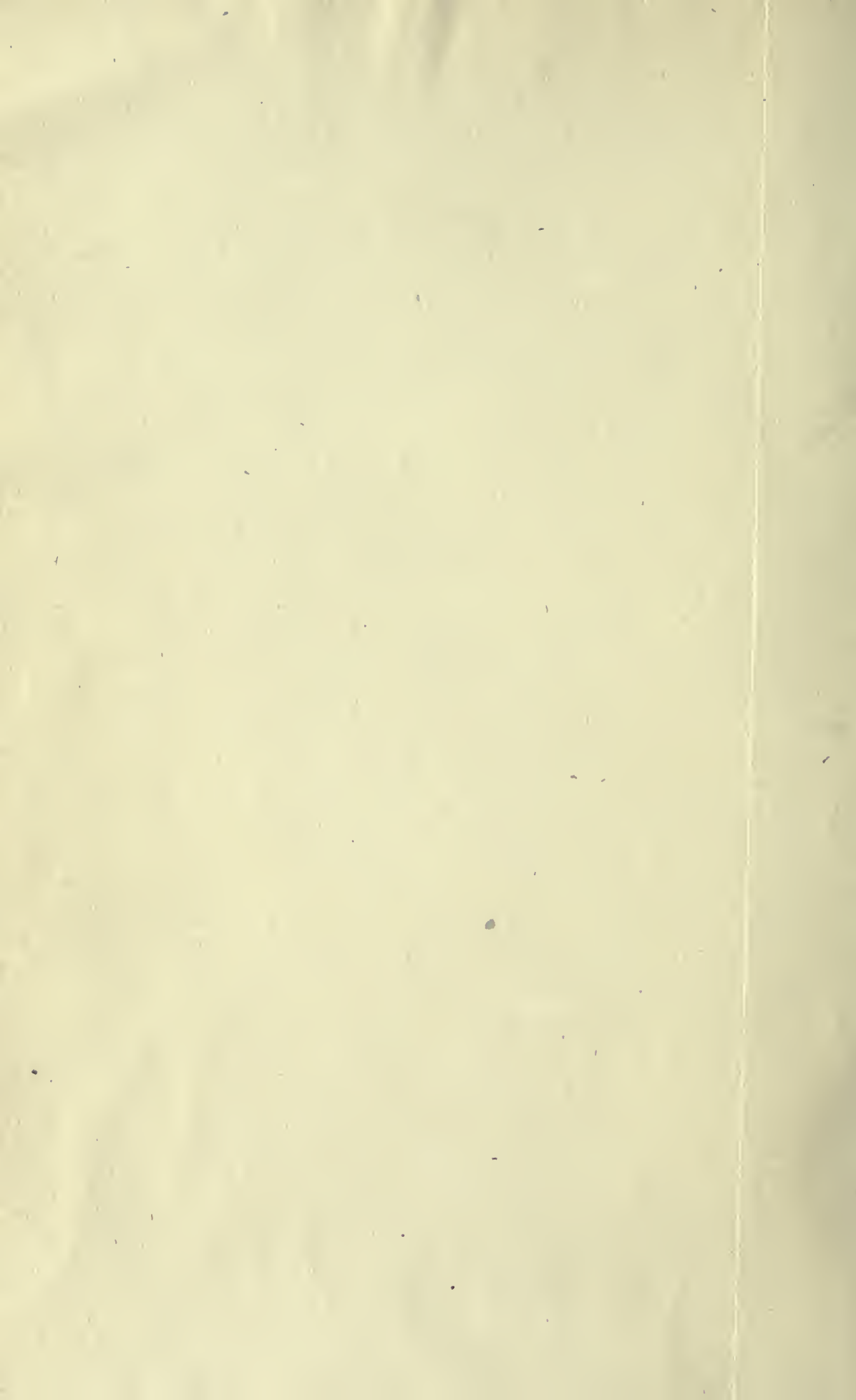








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# THE NEW PHILOSOPHY

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The first part of the paper is devoted to a discussion of the general principles of the theory of the structure of the atom. It is shown that the structure of the atom is determined by the laws of quantum mechanics, which are based on the principle of the uncertainty of the position and momentum of the particles. The second part of the paper is devoted to a discussion of the experimental results obtained in the study of the structure of the atom. It is shown that the experimental results are in good agreement with the theoretical predictions of quantum mechanics.

The third part of the paper is devoted to a discussion of the application of the theory of the structure of the atom to the study of the properties of matter. It is shown that the theory of the structure of the atom can be used to calculate the properties of matter, such as the density, the refractive index, and the specific heat. The fourth part of the paper is devoted to a discussion of the application of the theory of the structure of the atom to the study of the properties of the radiation. It is shown that the theory of the structure of the atom can be used to calculate the properties of the radiation, such as the intensity, the frequency, and the polarization.

The fifth part of the paper is devoted to a discussion of the application of the theory of the structure of the atom to the study of the properties of the elementary particles. It is shown that the theory of the structure of the atom can be used to calculate the properties of the elementary particles, such as the mass, the charge, and the spin. The sixth part of the paper is devoted to a discussion of the application of the theory of the structure of the atom to the study of the properties of the universe. It is shown that the theory of the structure of the atom can be used to calculate the properties of the universe, such as the age, the size, and the composition.

The seventh part of the paper is devoted to a discussion of the application of the theory of the structure of the atom to the study of the properties of the human body. It is shown that the theory of the structure of the atom can be used to calculate the properties of the human body, such as the height, the weight, and the intelligence. The eighth part of the paper is devoted to a discussion of the application of the theory of the structure of the atom to the study of the properties of the human mind. It is shown that the theory of the structure of the atom can be used to calculate the properties of the human mind, such as the memory, the imagination, and the reasoning.



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NO. I.

## Editorial Notes

### THE UNVEILING OF THE SWEDENBORG SARCOPHAGUS.

The ceremony of unveiling the sarcophagus made by order of the Swedish Parliament, for the reception of the mortal remains of Emanuel Swedenborg, took place in Upsala Cathedral on Saturday, November 19, in the presence of the King and Queen of Sweden, and the royal family, officials of Upsala University, the student bodies, or "nations" of the University, and representatives of foreign bodies, the latter, including Mr. Alfred H. Stroh, representing the Swedenborg Scientific Association, and the Academy of the New Church; Messrs. Speirs, Rendell, Wilde and James Wynter, representing the London Swedenborg Society, and also representatives of the New Church Society in Stockholm, of the Swedish House of Nobles, the Royal Swedish Academy, etc.

The sermon was preached by the dean of the Cathedral, Hermann Lundstrom, who extolled Swedenborg as "the universal genius with truly wonderful power of scientific intuition," a man who had "spread lustre over the Swedish name" as few others have done. It was eminently fitting that his grave should be among the great of his country, and the dean prayed that his memory may ever be an inspiration for Swedes. But, he added: "May the dross in the Swedish Seer's world-view and life-work do no injury, and may that which is noble and indestructible therein be of still undreamed of service."

In the name of his majesty he then ordered that the veil before the sarcophagus, be lowered, when the sarcophagus itself stood forth to view. According to the report of our representative, it is "a fitting monument in memory of him

whose ashes it is destined to hold." The sarcophagus was made at a cost of nearly \$3,000, voted by the Swedish Houses of Parliament, and from special designs furnished by the Court architect. It is hewn out of dark red granite, with pedestals resting upon a base, in two steps, of black granite. The carvings include emblems of the four faculties, theology, philosophy, medicine and law.

Five wreaths were seen upon the sarcophagus, having been previously sent to Upsala. At the head were two large wreaths,—the one from the Swedenborg Scientific Association, the Academy of the New Church and students in America; and the other from the London Swedenborg Society. The remaining wreaths represented New Church friends in Stockholm and Denmark, and two individuals. As the King and the distinguished guests were leaving the Cathedral, two additional wreaths were deposited, one by the representative of the Swedish House of Nobles, of which Swedenborg was a member, and the other by the representative of the Swedish Royal Academy.

The whole of the proceedings, with the preliminary royal procession to the Cathedral, in the course of which an address was delivered to the King in the name of the assembled "nations," was a magnificent tribute to the memory of the greatest of Sweden's sons.

On the evening of the 19th Dean Lundstrom invited a select party of gentlemen to dinner, and the dominant tone of the speeches made on this occasion was one of unstinted admiration of the scientific and philosophical attainments of Sweden's great son. Dean Lundstrom spoke of him as having been "discovered anew" by his countrymen; and he paid an eloquent tribute to the men in England who for more than a century have persistently recognized his commanding genius. The Rev. J. R. Rendell, of the London Swedenborg Society, spoke of his theological attainments, and added that the truths he had been privileged to give to the world were broader than all the churches; they were the common heritage of the race. Mr. Stroh, who spoke on behalf of the two bodies represented by him, was honored by a toast in recognition of his invaluable services in connection with Swedenborg's works, and



with the arousing in Sweden of an appreciation of the greatest of her philosophers.

On November 18th, the day preceding the events outlined above, Mr. Stroh and the representatives of the London Swedenborg Society were granted a special audience with the King in the royal palace at Stockholm. His majesty expressed friendly interest in the growing appreciation of Swedenborg and in the work that is being done by his professed disciples. He was presented, by Mr. Stroh, with finely bound copies of volumes I. and II. of the Swedish edition of the scientific works; and, by Mr. Spiers, on behalf of the Swedenborg Society, with an Address, written on vellum, and also with an advance copy, magnificently printed and bound, of the Transactions of the Swedenborg Congress. Of these advance copies only 25 have been printed, and these will be presented to each of the bodies officially represented at the Congress.

#### FESTAL PUBLICATIONS.

The unveiling of Swedenborg's sarcophagus was held under the auspices of the Royal Society of Sciences of Upsala, which on the afternoon of the same day, celebrated the bicentenary of its foundation. These two events led to a number of festal publications for presentation to the Society. These include phototype reproductions of the *DÆDALUS HYPERBORÆUS*, a scientific journal edited by Swedenborg, and of Swedenborg's thesis, *SELECTÆ SENTENTIÆ*, delivered on the occasion of his completing his studies in Upsala University; also a work by Professor Y. Vilh. Hultkrantz, entitled *THE MORTAL REMAINS OF EMANUEL SWEDENBORG*, besides a number of other publications.

Of these, however, only Professor Hultkrantz's has as yet come to hand; and this we have read with the greatest interest and enjoyment. The author was a member of the committee appointed by the Upsala Society to investigate the question of the authenticity of the skull found in the coffin in London on the occasion of the removal of Swedenborg's remains to Sweden in 1908; and in this work he describes in detail the work conducted by the committee.

First he gives an exhaustive account of the theft of Swedenborg's skull in 1816 and of its final restoration in 1823. After this comes the record of several thorough and independent lines of scientific examination of the skull itself, all of which so point to the same conclusion, that it may be considered as established with almost scientific certainty, that the skull now interred in Upsala Cathedral is indeed the skull of Emanuel Swedenborg.

Of equal interest are Professor Hultkrantz's conclusions, made on the basis of the bones found in the coffin, as to Swedenborg's personal appearance. The evidence he adduces confirms with some certainty the account of a contemporary who presents Swedenborg as a man of middle stature, with hair "approaching to a pale auburn." By means of a plaster cast, which he moulded with the skull as a base, the professor also confirms the fact recorded by Hindmarsh, who saw Swedenborg's face after death, that contemporary portraits were faithful likenesses of the philosopher.

The work is illustrated with numerous fine illustrations, including several portraits of Swedenborg, and was translated into English by Mr. Stroh and Miss Cyriel Lj. Odhner.

#### THE WORK ON GENERATION.

The editor regrets to announce to the subscribers to the forthcoming new edition of Swedenborg's work on generation, that, owing to the whole of the summer having been taken up by a journey to Europe, he has been unable to prepare the revision of Dr. Wilkinson's translation of this work in time for present publication. The work is now in hand, however, and it is hoped to have it ready some time in the spring.

## THE SENSES.

TRANSLATED BY E. S. PRICE, M. A.

CHAPTER VII. (*Continued.*)

**569.** *From these things it appears how the interior man fights with the exterior man in the rational mind.* 1. The exterior man consists of the senses even to the imagination inclusively; 2. but the interior consists of the soul. 3. The rational mind is the center. 4. The imagination continually pushes persuasions into the sphere of the rational mind; 5. but the soul reacts. 6. The general state of the rational mind is perpetually perverted, and disturbed out of its determination or form by the imagination; 7. but the mind by means of the faith which flows in from the divine spirit by the soul, reacts upon the mind. 8. Thus victory is perpetually treated of. 9. If the imagination, or the sensations, or the life of the body conquers, then the state of the mind is perverted to the extent that the soul can no longer react and restore it; 10. but if the soul by means of the supreme mind gains the victory, then it destroys the states induced by the imagination, and thus so many times as it were extinguishes them with death, or causes that it can fall back into a suitable, harmonic and more perfect state. 11. That there is such an action and reaction in our rational mind will be demonstrated in our Psychology: 12. And that there is such a state in the inmost things of the brain will also be confirmed in the part on the cortical substance, where that substance will be treated of especially. 13. But in order to demonstrate these things a great digression is necessary, or, a broad foundation must be laid, yea a temple must be built; for these shall furnish the interiors of our temple. Praise be to God.

**570.** (This was represented by gold which I was carrying, and which, although not so easily, would open the door, where within much gold was lying on a table, that is to say, it might give me access to spiritual things).



**571.** *In modifications or sensations singulars produce their own generals, and that indeed by their own active powers of acting.* 1. As especially appears in the nerves and their fibres and compositions. 2. For one fibre has reference to a unity, more, to some number of units; all the fibres have reference at once to the greatest number. 3. This number is intertwined in its own common membrane, which makes up a fascicle of those units, and it is that general to which the fibres included in the modifications or single sensations have reference. 4. General modification or sensation is that which is thus produced, and it exists in that fascicle of the fibres which otherwise is called a nervule, or the beginning of a nerve. 5. The modification of this nervule thus concurs with the modification of single things.

**572.** *General modification or sensation is produced by the modification or sensation of singulars through the fluxion of a superior form or more perfect spiral.* 1. It must not be conceived that modifications progress by right lines only along the fibres of the nerve; 2. but as in the atmospheres, that while they proceed from centres through right lines, they also go forth into spirals, 3. and that they likewise force their way through the spirals of their fluxion, and thus through the easiest way. 4. Altogether as in the atmospheres. 5. This progression into spirals, or fluxion through the easiest form, produces a complete general modification; thus from the atmospheres we can be instructed concerning the nerves, as we can from modifications concerning sensations. 6. While this fluxion thus proceeds, it is necessary that the fascicle or general creep according to this fluxion, and thus of necessity produce a general modification: 7. This is apparent to the eye in the strings of instruments, in stretched threads, especially in ropes, very far extended, or hanging in mines, when this phenomenon becomes visible, and it is a kind of spiral fluxion from the beginning of the motion; and, like the undulation in water, it is according to the length of the string or rope. 8. This fluxion persists with such great force, that, in the other extremity, where a similar fluxion shows itself, nothing can resist it, 9. and it is circumstanced according to the length,

tension, thickness and material of the cord; this I have often observed.

**573.** *The modification of simple things is to general modification as a root to its square;* 1. to the extent that there is a double ratio. 2. Wherefore the modification of simples proceeds by the ratio or analogy of simples, likewise the general proceeds by the ratio or analogy squared. 3. Thence the differences of modifications can be deduced. 4. But every modification *per se* not, unless it conserve the same ratio; that is to say, so that it be the same simple and the same square from one extreme to the other. 5. If many units be modified at once, then another square arises, which is similarly continued. 6. Many ratios at once, and, as it were, equations likewise produce their own general. 7. This exceeds all geometrical and analytical calculus. 8. This also appears from geometry; for a fibre must be multiplied with the whole fibre, which produces the area of the fascicle or nervule, so that this may be produced. 9. Thus the simple and the compound, or the root and the square, can by no means differ, for the one exists from the other. 10. But indeed respectively to the spiral fluxion of simples, which is a spiral of a higher form, it seems to be driven with infinite swiftness, so that it may arrive at that swiftness which actuates the compound, for the latter is composed of the former; 11. therefore, they correspond in swiftness. 12. This appears very evidently to the imagination in the atmospheres, of which above.

**574.** *This general which exists in the fascicles likewise produces a modification still more general, which finds place in the compound of the fascicles, or in the nerve itself.* 1. For a nerve is composed of fascicles; 2. wherefore there is a like ratio of the fascicles to their nerve as of the fibres to their fascicles; 3. so that the things which have already been said, can also be referred to this place; 4. wherefore, only let application be made; 5. but only with this difference, that the fluxion of the more perfect form then goes off into the fluxion of a more imperfect form; 6. or from a spiral into a circular form.

**575.** *This general modification is likewise to its own more*



*general as a root to its square, or what amounts to the same thing, as a square to its cube.* 1. There is a similar ratio and analogy. 2. For if there be a simple ratio of 3 to 4, then the ratio of the squares is as 9 to 12, and of the cubes as 27 to 48; and the ratio is the same everywhere, for 3 is to 4 as 27 to 48, and so forth. 3. Therefore, also the modification of the whole nerve, which is the most general, coincides with the general modification or that of the fascicle, as the general or that of the fascicles with the simple modification or that of the fibre or fibres.

**576.** *From these things it follows, that no modification comes to manifest sensation, unless its simple be elevated to the cube or to the third dimension.* 1. Even so that every modification must represent a kind of body before it can become manifest. 2. This appears in the atmospheres. 3. It appears similarly in the nerves and their compositions; it also appears in strings, the vibrations of which must arise in a triplicate ratio, before it can become sound; that is to say, the first ratio is through the fibres of the string; the second, through the visible vibration or undulation, thence resulting; the third, through the body of the adjoined instrument, without which there is no sound. 4. A similar thing obtains in the purer sensations and modifications. 5. Therefore, every modification puts on, as it were, a kind of body, in order that it may be anything.

**577.** *A like thing as has been said of the nerves, is also to be said of the beginnings of the nerves. that is, of the cortical substances, where changes of state exist, and sensations themselves according to those states;* 1. for there all the vibrations of the fibres arrive at their boundaries, 2. as from the origins of motion to their expanses, as it were, to their atmospheres, 3. in which all the fibres are likewise modified, which in general correspond therein; 4. but the fluxion pervades according to the determination of the fibres therein. 5. The determination of the fibres therein is entirely according to forms, of which we have treated when treating of the atmospheres. 6. Wherefore the fluxion does not end except in the unity of every fibre, or in its beginning, which beginning thus takes on



change of state, 7. and thus induces changes of state upon those things of which it is composed, but this change is a change of their fluxion, wherefore it is affection, in which the sensation ends; 8. but of this below, where the fluxion of generals into singulars is to be treated of; hitherto the treatment has been of the influx of singulars into generals.

**578.** *The brain in itself and every cortical substance, are divided into their own fascicles like as the nerves, and these fascicles into their own fibres.* 1. For the whole brain is compounded into congeries, and these into glomes or protuberances, and these into clusters. 2. The glomes refer to the whole nerve, 3. the clusters, to the fascicle, 4. every single glandule, to the fibre. 5. Thus a like ratio is carried out in both directions.

**579.** *Every single cortical substance is similarly divided.* 1. That is to say has its own surface, the most delicate meninx, made up of passive fibres. 2. Every single fibre flows by the form of its fluxion to its own beginning; 3. the fibrils of this, or the shades or analogies of the fibrils flow likewise to their beginnings.

**580.** *In the single cortical substances reside our internal sensory faculties,* 1. for there is a similar ratio, 2. with a difference only of perfection. 3. A visual idea, to which imagination corresponds, belongs to the general of the whole glandule. 4. But an intellectual perception, whence is thought, or inmost sensation, corresponds to those beginnings; 5. thus without an examination of the cortical glandule we do not proceed in rational psychology, or in its demonstration. 6. Of what quality this is is known from the brain, by means of the doctrines which are to be given. 7. In the meanwhile we can conclude from the given beginnings in the nerves.

**581.** *That inmost sensation or intellectual perception, which, made active, is known as thought, necessarily produces imagination, as its general,* 1. entirely in accordance with the demonstration drawn from the fibres and atmospheres. 2. We cannot yet proceed to the like demonstration itself of the geometrical form, for the form or determination of the fibrils in the cortical glandule has not yet been examined. 3. In the

meanwhile there is the same ratio of cause, why thought cannot exist, unless it produce imagination, or contemplative sight, such as is represented in the eye; 4. they must be together, 5. as also every one recognizes in himself if only he attends to his thought. 6. This is the reason why we can distinguish imagination from thought with such difficulty; 7. while nevertheless thought is to imagination as a simple to a compound, or as a root to its square; 8. for imagination is an inferior degree of thought.

**582.** *Imagination itself produces also a third composition, namely, a certain kind of internal speech;* 1. that is to say, what it draws from hearing itself. 2. Hearing is an inferior degree of sight. 3. Thus thought passes over to ideas by formed expressions, 4. as every one can observe in himself, that is to say, that he cannot think unless he bind his thought to contemplative ideas emulous of visual things, and the latter to ideas which correspond to certain words, or to ideas formed by words, 5. to the end that there may be finally, as it were, internal speech to which thought may attach itself. 6. This is the reason why the words are so easily called forth from the memory, and why thoughts can so easily bring themselves forth by means of words and by speech; 7. for they are called forth, as it were, spontaneously. 8. For all sensations are only changes of state, which mutually excite each other; that is to say, from single changes of a state arise the general, and from the general the most general; 9. but not likewise singulars from generals, and generals from the most general, or in an inverted order which we do not live. 10. Of these we are now to treat.

**583.** *These things have been said of sensations, which propagate themselves from singulars to generals; but the same indeed propagate themselves in another way, namely, towards the interiors, for thence affections exist.* 1. It is the very harmony of sensation which propagates itself toward the interiors, but not the modes themselves. 2. Modes propagate themselves toward exteriors; 3. but as has often been observed, affection arises from the harmony of modes, which does not put itself forth except when it has come to inmosts or to the connection of inmosts.



**584.** *All sensations propagate themselves toward inmost things, or to the soul itself.* 1. As, if you please, for the sake of illustration, in the nerves or fibres: 2. Let there be a fascicle which is modified, as in sounds, but not a single fibre in the fascicle; 3. then the harmony in the fascicle cannot produce any single modification in the fibres; 4. as when a monochord or cymbal be struck a sound does not thence return into any chord; 5. but according to the harmony of the modified fascicle the state of the fibres or the connection between the fibres is changed; 6. thence the fibres are affected according to the change of the state or nexus. 7. Because the single fibres are connected to one another this change of state returns into every single fibre, 8. which is thus contracted, or extended, or expanded, or otherwise twisted, according to the common state. 9. Because every single fibre is connected by its fibrils, therefore, according to the state induced it changes the state of its fibrils, and thus even to inmosts. 10. Wherefore the affections pervade to the inmosts or even to the soul; while affections themselves cannot exist, unless they induce upon themselves a body pervading to ultimates.

**585.** *In a similar manner and most perfectly, things are circumstanced in the beginning of the fibres, where there are brains within brains, and all the beginnings are connected to one another, and are arranged in nature's most perfect order, according to every nature of modification.* 1. Let us conceive that in a certain cortical substance there is a kind of new brain, composed, as it were, of its own cortical and medullary substance; 2. and that, as in the brain, every part of that substance is arranged in a most orderly manner, and in mutual harmonic, and natural connection with its associates; 3. and that in these latter themselves there is again a like order, 4. in which the soul herself resides, thus organically clothed. 5. From these things it now follows, that a general modification such as sound, that is to say, its harmony, pervades from the brain even to the single cortical substance, 6. and arranges its state according to the harmony of the sound; thence will be the first and general affection. 7. This affection arises from a changed order among those parts; 8.

this change carries itself through to its centers, and induces a similar change of state upon them, 9. these latter again, upon those smallest or purest things, which lie hidden within. 10. Wherefore it subsists therein, for the connection ascends thither. 11. Thence is the affection which is felt in the inmosts or in the soul, 12. which thus resides in the center, and contemplates all the rest as constituted in its peripheries. 13. While the soul thus feels the change of her own state, she also feels the general changes of state outside herself. 14. *Thence come the affections, which are produced by means of sensations.* 15. For they all cohere in such order, that the least may feel what the greatest suffers; or that the center may feel what happens in the peripheries, 16. and, indeed, according to every variety of harmonies. 17. So in the nerves and fibres; 18. most perfectly, however, in the beginnings of the fibres, 19. where they all reside as in modified auras, 20. but connected; and thus by a single way the soul feels the changes of all states, 21. and is thence affected. 22. Wherefore affections belong to the soul which is in the order of her nature, 23. and holds all things about her decorously bound in the same order.

**586.** *Every interior sensation is affected according to its own nature:* 1. As from touch, taste, smell, hearing, 2. the imagination perceives whether a thing delights, is appetizing or desirable; thence is delight, appetite, desires, 3. the understanding perceives whether a thing be good or evil, according to its order, which is induced, or according to its own loves; then also whether a thing be true or false according to its ends, which for the most part have respect to loves; 4. the soul perceives according to universal ends. 5. These affections coincide; 6. wherefore they are excited, and indeed ultimately, if by the imagination, the understanding consenting; or if by the understanding, the soul consenting. 7. But of these things we shall treat in the doctrine of influx.

**587.** *Affections are the more sensible the more they enter or penetrate from more general things towards the soul;* 1. for then they traverse many degrees, and thus the subjects and objects of the affections are multiplied. 2. Thus touch is the most sensible affection, as may appear from pain, which is the greatest if it is in the body, or some organ. 3. The affec-



tions of taste and smell follow; these are mere affections; 4. musical harmony comes next, which has but three degrees to the soul; 5. optical harmony, or the delights of sight, are less sensible, for it has only two degrees to the soul; 6. similarly the imagination; 7. but thought and understanding are less sensible, for they are next to the soul, which is affected. 8. *But the less corporeal sensible affection is, the more it affects the soul, for the nature of the affection approaches more nearly to the nature of the soul's affection.* 9. For the nature of the affection of the understanding is good and evil respectively to loves and ends. 10. Not so the nature of the affections of the imagination; they have respect to the body. 11. Wherefore the love of one's own glory affects more than the love of the body and of riches; 12. yea, the love of the body affects so little that the loss of it is often willingly sacrificed, that the other may be obtained.

**588.** *All [these things] deport themselves according to the order, respectively to good and evil, in which the rational mind is, wherefore according to its principles.* 1. The principles themselves come either by a posterior way, and are thus said to be intellectual, 2. or by a prior way, that is to say, by a certain faith accorded to those whom we believe to understand those things better than we, 3. and because we are thus persuaded that those things are true. 4. All things in the eminent organ of the understanding are arranged according to this order. 5. They are arranged according to a most perfect order if they be principles of truth, and if the loves be superior; for therein they are the more perfect. 6. On the other hand, according to the falsities which are in the principles, the order is perverted; 7. wherefore affections are circumstanced altogether according to the order in which the rational mind is. 8. For the soul is disposed according to the same order as to its loves. 9. Concerning these things you will see the doctrine of influxes; for from these one can conclude, *how the soul can be affected by the principles and loves of its rational mind*; for it is in connection with the mind. 10. there also it comes to be discussed how it can be reduced into its own more perfect state, through received truths and through more perfect loves, the loves being removed which

are imperfect, and which altogether pervert the order. 11. But this is a matter of deeper inquiry; I nevertheless line it out (*collimo\**) thus far.

589. *All changes of state exist according to affections; 1. for the affections produce changes of state in the inmost sensories. 2. And such as are the states in the inmost sensories, such the state exists in the outmost sensories. 3. For every state in beginnings is propagated into the fibres, and through the fibres into extremes. 4. But I confess that these things are thus far obscure; I expect clearer light. 5. I seem to myself to perceive only this, that sensations cannot be produced unless they propagate themselves towards the exteriors, and receive general things; and at the same time towards inmosts and the soul, whence arise the affections of sensations. 6. Thus whatever is modified by the external sensories, this pervades the whole nexus to generals, and at the same time to things most singular. 7. In things most singular, as in their own center, are harmony itself, the very nature and soul of the kingdom, order itself, perfection itself and life itself. 8. But the affection of moral truth and good does not exist except in the understanding. 9. The understanding cannot but affect the soul, and form a like state of it; 10. wherefore there is given to it the choice of good and evil. 11. In order that a state of it may thence exist, to which felicity or infelicity may conformably redound.*

590. *We can best learn from the atmospheres what kind of affections exist, as also sensations; the sole difference exists, that as in the atmospheres the parts are free, and thus the free parts are modified, so the parts of the animal kingdom, especially in the cortex, are bound; and there is furthermore this difference, that in the animal kingdom the beginning or soul is alive, from which soul the rest of the things therein derive their life according to form; of this organic form I venture to tell. 1. The modified atmospheres indeed are concentrated towards the single part, as has been shown above. 2. The single part receives the form of modification of the larger part, yea, that of the whole. 3. This part, because it is a constant*

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\*I believe this word ought to be *collino*.—Tr.



little volume from the purer atmosphere, thus affected, cannot but communicate that affection with those things which flow within, and compose its form. 4. This form similarly communicates with its own inmosts. 5. Thus the atmospheres themselves suffer from disharmonies even to their inmosts. 6. But because all the parts are free, they flow back when the modification is finished. 7. From these things also, in some measure, but as in a shadow, it can be deducted how the universe suffers from the perverted state of man; 8. but this does not belong in this place.

591. *These affections arise from all our five senses, as from touch, taste, smell [hearing] and sight; 1. for they are affections arising from the harmony of the modes themselves in themselves and among themselves; 2. which coincide simultaneously or successively. 3. Taste is such an affection, 4. similarly smell; 5. hearing is such in respect to song and modulation; 6. sight, in respect to images and colors. 7. In every mode of song that kind of affection lies hidden, as also in every color of sight; 8. likewise in the harmonies between the modes of song and the images of sight. 9. In these things sensations are nothing but affections, for, as has been said, they coincide, nor can there be sensation without affection. 10. Wherefore in these matters brutes have things similar to us.*

592. *There is a true pre-established but natural harmony of these affections, in that the connection of all even to the very inmost has been co-established. 1. So far, that there is not a pure correspondence, 2. and thus a pre-established harmony of the one without connection with the other, but with the connection; 3. wherefore there is a continuous influx to be explained by the laws of physics. 4. This also falls under demonstration, yea, God willing, it shall fall. (On account of these things wonderful things happened to me that night between the 1st and 2d of July.\*)*

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\*In the original MS. three lines are here crossed off; they read: "These things which I have written were foreannounced to me in a wonderful way. See the dream

of July 1 and 2; I wrote it July 2." See the editor's preface to DE GENERATIONE. The dream here referred to will be found in a note to n. 316 below.—TR.

593. *But speech, with its words or sounds or articulate modes, flows in otherwise; and indeed even to the soul, not by harmonic affections, but by the changes of state alone, from which every idea of harmony has been clipped off; likewise also by the images of sight and by other modes.* 1. Speech consists of diverse modes, altogether differently combined, 2. thus especially of effects, so that there is nothing naturally harmonious in them; 3. wherefore they flow, not according to a certain natural harmony, according to the natural order of the organic parts in the fibres and cortical substances, 4. but only by the mutations of state without harmonies. 5. There is something separate and articulate in every syllable, and in every word; 6. whence a word reports what is as it were simultaneous, but speech from words, something successive, which also must be put forth without harmony. 7. They are only complications formed from diverse openings, closings and determinations of the mouth, lips, throat, palate and nostrils with the aid of the tongue, then further by diverse openings of the glottis, and a certain arrangement of the trachea and lungs. 8. In every single syllable, word, expression, is something artificial, not natural; 9. wherefore there are as many languages as there are races of men, as many dialects as there are provinces of races. 10. The one does not understand the other; it would be otherwise if the languages were natural. 11. There are consonants and vowels variously so formed. 12. There is also a language of the fingers. 13. There is a language of conventional gestures, like those of the deaf; these languages approach more nearly to the natural significance of things; but still not by harmonious affections. 14. There can also be a language by contacts alone, and their differences, in the body, in the palms of the hands and elsewhere. 15. There are similar languages in sight, nor are they harmonic images but letters variously figured; 16. thence the written letter teaches the same thing. 17. There is a certain affection but not natural harmony, 18. wherefore it thus enters towards the soul, but with no natural harmony, so as to be called delightful or undelightful. 19. Therefore every such thing is plucked away from the words; 20. and they can be pronounced with any tone



whatsoever, and a letter can be written in any color whatsoever; 21. thence it also is that the sound is formed otherwise, for it is not canorous, but recitative; not dancing but walking.

**594.** *There can also be induced upon speech a kind of affection, by which one can induce a certain kind of harmonic sound;* 1. so that there may be a kind of sweetness in the sound; 2. by the raising and lowering of the sound by means of quantity, so that the sound may be higher or lower; 3. a kind of harmony, so that the first may be graver and the last sharper, which is expressed by thesis and arsis. 4. The harmony is similar in the succession or in speech, 5. according to nature which they imitate in the accent; 6. thence is recitative speech, as in the opera of the Italians, and in orators and others, which thus superadds something to speech, the better to persuade or excite the affections. 7. They who sing words, or join the voice to song, whence is vocal music, 8. likewise adjoin the harmonies of instruments. 9. Such natural sounds are also in some words, as for instance, those which imitate nature, as hissing, tinkling, murmur, thunder, etc.; 10. but they imitate the sounds of natural sounds only for the sake of better comprehension; 11. but still there is nothing intellectual in such a sound only a natural imitation. 12. The speech of the affections alone is in brutes, indeed no other. 13. But this speech is proper to the human race. 14. Such speech as involves a certain affection is to be called partly natural, 15. such as music imitates; which can thus, by art, imitate nature, as a picture, images; 16. as is evident from pathetic music, especially Italian. 17. A similar speech is formed before the eyes by symbols, as the Egyptian, but not by colors; 18. for colors excite another affection, symbols a certain superior or intellectual idea.

**595.** *From these things it follows that articulate sound or speech is artificial, but not natural,* 1. unless something natural be superinduced upon it. 2. Thus it cannot from itself excite any correspondence in the inmost sensory, still less in the soul. 3. For affection, resulting from harmonies, excites something correspondent in the inmosts; for it is circumstanced according to the natural order of all the compositions of the fibres, of the brain, and of its cortical substances. 4. The former or

harmonic affection excites a natural harmony, 5. but the latter a spiritual harmony, 6. which, according to the order of nature, cannot be excited; for spiritual things do not thus correspond; 7. as inferior and superior loves so altogether disagree, that the superior destroys the inferior, and the inferior extinguishes the superior. 8. It is otherwise if the state is perfect. 9. Speech, therefore, is for the sake of the understanding and its parts, and thus for the sake of the choice of moral and spiritual good and evil; 10. wherefore it is proper to man alone. 11. It is an indication that the human soul is a spiritual entity, which, by the aid of the understanding and of choice, and then the influx of the Divine, is to be prepared for a certain celestial and spiritual state, 12. to the end that it may be conjoined to the supreme by love. 13. This is a sufficiently manifest indication of a future state. 14. This is the reason that the sound of speech of itself excites nothing spiritual, unless, by cultivation, it have previously been understood spiritually.

**596.** *Articulate sounds are formed first of all of those things which occur to every sense, not only the essential varieties, but also the accidental and modificatory.* 1. These are the first elements of speech, 2. that is to say, that those things which occur to the senses may be pronounced or signified in certain articulate and formed sounds; 3. thus whatever is in every sense, in touch, taste, smell, hearing and sight; 4. indeed, whatever occurs to any sense, especially to sight. 5. Hence also there are infinite effects, infinite phenomena, whether they be natural or artificial; these things are furnished with their own names, 6. whether with a somewhat simple name, or with many. 7. Wherefore there is something peculiar in every single language, in that it embraces many things in a single expression, or expresses more intimately the essence of a thing; 8. indeed not only what our senses, but also what our actions furnish. 9. Our senses exist by modifications, wherefore the modes themselves are expressed in their own words, and indeed variously. 10. Then also there are accidents or adherents, or things flowing from the modes; 11. wherefore there is something natural in the single languages, in which things they agree; but it is expressed by the nature of the sensations



which are natural. 12. Wherefore also there are affections of sensations. 13. Then also there are changes of state, 14. and the very effects going forth thence. 15. Wherefore sensations are the bases of speech.

(*To be continued.*)

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## THE FIBRE.

### CHAPTER VIII. *Continued.*

147. *As the artery, into whatsoever gyres it be flexed and turned, yet drives its fluid even to the extremities; so the fibre, in whatsoever manner it be flexed and turned.* As regards the arterioles, these are flexed and reflexed according to every form of the little body which they irrigate,—as in the glandular vesicles, the muscular fibres, the sanguineous vessels, and elsewhere; for they are so easily drawn into gyres and spires that Leeuwenhoek has counted more than a hundred circuits in the space of a single finger nail. (Trans I., n. 125.) If it is the muscular tunic that pushes the blood on, it matters not to the artery what kind of curves it makes; but it would be otherwise if wave propelled wave. Fibres are borne still more perfectly into similar gyres, as is plain to be seen in the brain and the body. In the brain, the fibre, hatched from its cortex, pants through a thousand windings to its crossroads, its little stations, and its goals. Thus, in the case of that abundant fibre which runs from the cortical circuit and from both corpora striata, towards the medullary centre, it is twice or thrice reflected upon the roof of the larger ventricles, and frequently retraces its path, so as to find and embrace, in the corpus callosum, its companions of the other hemisphere; thence it curves back towards the base of the fornix, in order that, when almost returned, it may cast itself upon the thalami of the optic nerves. There are fibres which, like a network of threads, twist themselves into a thousand angular flexures before they seek the fascicles wherein they may proceed in a straight direction. The fibres of the cerebellum arise from the peduncle quite obliquely, towards the annular protuberance on the one side and underneath the testes on the other where they so

consociate and interweave themselves with the fibres of the cerebrum, here running to meet them, that they may, not unaptly, be compared with the spires and incisions in a stone mill-wheel (see the figures of Vieussens and Willis); and when both together have deeply immersed themselves, and in part have again emerged, they take a step backwards, and conjointly stretch their way to the medulla of the spine, or to some little nerve. The like is the case in the medulla of the spine, where in addition to perpetual circuits of fibres, there are also fibres that ascend along the neck in a straight line towards the great foramen of the occiput, and thence are flexed back towards the eighth pair\* of the nerves of the head, and by this way return to the pharynx and larynx or to the neck. In the body in like manner; for the fibre creeps around artery, motor fibre, vesicle, follicle, glandular and gangliform corpuscles and grains, like ivy, especially the sensory fibre which, by sinuous plexuses and serpentine tortuosities, weaves papillary forms in the tongue, or other organic forms in the ear, the eye, and the cuticles. But why should I go through the fibres? such as those in the stomach, intestines, pancreas, spleen, liver, lungs, heart? In a word, it matters nothing whether the fibres be borne backwards or forwards,—provided only they be bent whither use commands; for, despite all, their fluid, emitted from the cortex, passing through innumerable labyrinthine windings, nowhere set back, that is, nowhere delayed by what it meets, hastens on, quicker than the flash of an eye, or than the will, to its ultimate organic goals, sensory or motory. Therefore since the fluid runs through the fibre and modifies it; and since, when the fluid acts, the tunic reacts in the most perfect manner, and vice versa; and since in every single point there is a likeness of the cortex; it follows that this fluid runs through its canal spontaneously, howsoever the latter be flexed and reflexed. Indeed it will be demonstrated that the circular or spiral form of fluxion is more suitable to the nature of fibres than the rectilinear, into which

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\*The Par Vagum; see note to n. 117, above.—TR.



latter the fibre is not borne but forced, as when it is bound up in a nerve.

148. *As the artery drives its blood forward by a mode of undulation, whence arises the pulse; so the fibre drives its fluent spirit by a species of superior undulation, or by modification.* That the circulation of the blood is carried on by a successive promotion of the undulation within an imperceptible moment of time, whence arises in every single part of the permeated vessels that sensible elevation called the pulse, see Trans. I., n. 166-170, 179; and that this little wave, having received its first impulse from the heart, is afterwards promoted by the whole arterial system, *ibid.*, n. 173; that this is done still more rapidly in the fibres, *ibid.*, n. 176. Modification belongs principally to the auras and also to the animal fluids; and it corresponds to the undulation seen on the surface of water. For sound comes to the ear by modification of the air, and an image [to the eye] by the modified ether. Thus modification signifies a mode of the transmission of a sound or image from one distance to another. Such modification never exists without an origin or a principle of motion. But the doctrine of modifications is of such great extent and excellence that it easily holds the first place in physics; for the quality of nature, yea, and of substance, declares itself by modification. That the animal fluid emulates the modifications of the atmosphere, see Trans. II., n. 269, 290, 291. But to proceed: It is evident from the fabric of the arteries and that of the fibres which is compared to it, that both arteries and fibres are constructed after every form of the undulations and modifications of nature.

149. *Thus every wave expelled from the first starting point of motion is present, not actually but potentially, in its latest goals.* For such is the nature of modification; in such way is the solar ray carried to the earth, an image to the eye, sound to the ear, a wave to the shore,—the wave being not the same as that which was first expelled but continuous therewith.

150. *As the blood running through the arteries is borne along in a steady stream and with increased celerity; so the*

*fluid through its fibres.* Concerning the arteries, see Trans. I., n. 174, 175, 176, 179. The same also follows from the fact that there is a likeness of the heart and cortex in every single point of the artery and fibre, and that there is a tunic which simultaneously actuates the little stream. If neither the tunic nor the inflexions of the vessel cause any delay (n. 147), it necessarily follows that the celerity of the motion increases, and not the reverse. If the mere force of the heart actuated the fluid, then the celerity would be the rather diminished; and therefore many of the learned have fallen into this opinion, although all effects and phenomena dictate the contrary. This undulatory transmission of the blood may be compared with the rise or fall of bodies from one region into another that is either lighter or heavier; that is to say, such bodies in their ascent or descent continually increase the degrees of their celerity in a duplicate ratio.

**151.** *As the tunic of the artery is formed to the nature of its blood; so the tunicle, or most delicate surface, of the fibre is formed to the nature of its fluid.* That the tunic of the artery is most exactly accommodated to the nature or the force and mode of action of its artery, see Trans. I., n. 134, 135; and indeed so exactly that, given the blood or its nature, we may conclude as to the quality of the tunic, and, given the tunic, as to the quality of the blood; for the fluid constructs its own tunic, as is evident from the first stamens of the embryo and chick. So also the fibre in respect to its fluid. But the nature of the fibre's tunic will come to be demonstrated below; and, therefore, I defer for the present any further treatment of the conformity and parallelism existing between the fibre and the artery. There is one thing, however, which, I think, should not be passed by in the present treatment, namely, that the tunics of the fibres are of such great fineness, that they distinctly comprehend, carry down, and sensate the forces of purer nature, such as the modifications of the most subtle ether, or the distinctions between the lightest touches, and the forms, harmonies, and disharmonies arising therefrom. If the tunicle on which the modifying forces impinge were not most exactly accommodated to the nature of its fluid, the



organ woven of the fibrils would never actuate any sense, nor would an image exactly similar to that which is, as it were, present in the external sensory, be at the same moment represented in the cerebrum. Wherefore as soon as the apt formation of either [the fibre or its tunic] begins to be destroyed or obliterated, then distinctions of modes and the differences between things begin to be confused, that is, sensations begin to grow dull. The nature of the change undergone by arterial and venous vessels when, later on, they are permeated by a fluid of another kind, is clear from the umbilical vessels, the hepatic tube,\* the arterial canal,† the muscular tendon, and from other more minute vessels in the skin, the dura mater and elsewhere,—all of which then simulate filaments, cords, funicles, muscular strings, and networks; in a word, canals of another origin, disposition and denomination.

**152.** *Thus the tunic with its included fluid constitute one vessel and act as a single cause.* The containant and the contained taken together are what is here called a bloodvessel or fibre; for a vessel without blood and a fibre without its contents of uttermost fluidity, is a mere membrane; while the blood without a tunic is a mere undetermined liquor. It is the continuous or coherent part of the artery and fibre, that is to say, it is the tunic that is the highway for the determinations of the fluid from the interiors of the kingdom to its exteriors, and vice versa.

**153.** *Hence, as the circulation of the blood is carried on through the arteries by the active and reactive force of their muscular tunic; so the circulation of the purer fluid through the fibres by the active and reactive force of the enclosing*

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\*Our author, perhaps, refers to the ductus venosus, a vessel in the foetal circulation that carries the placental (arterial) blood from the portal vein to the inferior vena cava. The ductus venosus becomes impervious three or four days after birth.—  
Tr.

†The ductus arteriosus,—a short vessel in the foetal circulation that carries the venous blood from the pulmonary artery to the aorta. After birth it becomes closed, and is called the arterial ligament.—Tr.

*tunicle.* That the tunic acts upon the blood and the blood upon the tunic, or, that the one is passive when the other is active, may be seen amply confirmed in Trans. I., n. 182-186. The whole of medical science lies in the restoration to the blood of its action, and to the tunic of its reaction, that is, of its natural tension. So also in the fibres, to which we can be led by induction from the arteries, by a mode of elevation to a superior power, as in analytical calculus. But for a deeper understanding of the subject, the fabric of the tunic itself must be expounded.

154. *As the artery, distended with its blood, is stretched lengthwise, and at the same time breadthwise; so the fibre traversed by its fluid.* That the artery of the body is stretched out when dilated, see Trans. I., n. 228, 229. But it is different with the artery of the cerebrum, which change its natural disposition into a disposition mediate between the venous and arterial, *ibid.*, n. 218. But to proceed: That impletion expands the artery at the same time that it stretches it, is clear from the nerve when taken out and dried; for it then contracts and shortens. Indeed a fibre, when cut, springs back, as it were, to itself, and is twisted up; confer Trans. I., chap. vii, [n. 460-578] on the cardiac nerves, and Trans. II., n. 172-175. But that, in these respects, the fibre itself induces a similar nature on the arteries of the brain or palace of the body, that is to say, that it is shortened when filled, will be demonstrated below.

155. *As the artery flows from the heart into the motor fibres of the muscles; so the fibre flows from its cortex into the same motor fibres, but at unlike moments; whence arises action and reaction, and, from this, alternate and reciprocal motions.* That the proximate efficient cause of muscular motion is the fluid in the fibres and the blood in the arteries, which two mutually and alternately react on each other, see Trans. I., n. 504, 511. Moreover, every tyro knows that into each muscular fibre flows a fibre from the cerebrum, using the term in a broad sense, and an artery from the heart; and also that when the artery or fibre is injured, compressed,



emptied, or cut off, the muscular action ceases; and that the animation of the cerebrum coincides with the motion of the heart, not in adults, but in the embryo, Trans. I., chap. iii, [n. 241-315]. For the rest, see our Transaction on the Muscles.\*

**156.** *As in the arteries, resides strength; so in the fibres resides the force of forces and the life of the body.* Concerning the arteries, see Trans. I., n. 231-233. But that in the fibres resides an active force, or, in the simple fibres a force of forces, is sufficiently comprehended from their origin, field of action, and effect. *The origin* is in the brains, whence, as from a common fount, flow forth all the forces or actions of the muscles; and this by way of the fibres, which are so many highways of determinations. *The field* or extension of *action* is into the whole body; for where there is no fibre, there is no active force and sensation, but instead, something dissociated from the sensitive and voluntary life of the brain. For superiors flows into inferiors, and vice versa, according to the mode in which the substances are formed, and in which, by connection, they communicate with each other. Trans. I., n. 622. *The effects* are sensations and actions, or are all those phenomena of the kingdom produced by the fibres together with the arteries; for, in the whole system, there is nothing but fibre and vessel, the determinations of these being the forms that constitute the entire animal machine. But to proceed: In order for the existence of strength there must be efficient forces of strength.

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\*No Transaction on the Muscles was ever published by Swedenborg. But among his manuscripts are two which deal with this subject. The first, consisting of 22 quarto pages, is entitled "8. On the Muscles in General," and consists of extracts from Boerhaave, Willis, Vieussens, and Winslow (3 Documents. 866). The other, which consists of 13 folio pages, is clearly Swedenborg's Induction. It deals with the

muscles of the face; the affections of the animus as effigied in the countenance; and the muscles of the neck and abdomen. (3 Doc. 942, VI. Phot: MSS. 13 seq.) These two manuscripts are probably the draft of a portion of the proposed treatise on the Muscles, which was to have formed one of the "Transactions" of the ECONOMY OF THE ANIMAL KINGDOM.—Tr.

Hence, if there be strength in the arteries, the fibre must be the efficient or producing force. This is apparent from the fact that the fibre inflows into the tunic of the artery, and the fluid of the fibre into its blood. Therefore, in familiar speech, we are accustomed to attribute the force and strength of the body to the nerves. From these considerations it is sufficiently evident why the arteries only, and not, like elsewhere, their accompanying veins, ascend from the kingdom of the body into its palace or cerebrum, and there, by means of the cortex, transcribe their life, now at the end of its course, into the fibres; namely, in order that strength may be added to the brains, force to the imagination and hence to the genius, and a faculty capable of determination to the will.

157. *In a word, as the artery is continually striving to constrict itself, or to contract to its least diameter; so also the fibre.* That the artery loves to stay and rest in the least diameter of its contraction, see Trans. I., n. 178, and the experiments there adduced. For experiment has shown that the muscular tunic of every artery presses upon the enclosed blood, whence arises a general equilibrium of the pressure of the arteries; on which subject, see Trans. I., n. 178, *seq.*; and a wave sent from the heart into the artery, wheresoever it be, is urged to its exits, that is, into the veins. Nor can it be doubted that the tunicle of the fibre also endeavors after the same thing. For when hurt by the least friction, it straightway wrinkles up, contracts, and quivers; and when cut, it betakes itself to its spire, twists up, and closes. *But the fluid, emitted and injected alternately by the heart and the cortex, holds both expanses.*

158. *Thus the artery and fibre are continually balanced between a state of the highest constriction and of the highest expansion, that is, between death and life.* Constriction is the death, and expansion the life, of both artery and fibre. For in the dead, they are emptied, closed, contracted. So likewise in fear, which is a likeness, and simulation of death, since death then stalks before the eyes; for the blood then rushes headlong from the arteries into the veins; hence the muscles loosen, the joints fail, and the mind is arrested as though half extinct; all



of which effects result from the constriction of the artery and fibre, or from the cessation of circulation. In the midst of these dangers life does not return to the body unless both vessels be again raised up, and the circulation renewed; for, in the animate body, which lives by motion and is moved by life, there is nothing excepting the artery and the fibre. Therefore we die by nature, because, of itself, the artery is continually striving to constrict itself, or to contract to its least diameter, n. 157; but we do not thus live by nature, because the artery and fibre are forced to expansion contrary to their own nature, and this by means of life or the soul, which is the superior force. Or, what comes to the same thing, in that we are body and matter, we die; but in that we are soul, we live; for nature regarded in herself is dead, and merely serves life as an instrumental cause, Trans. II., n. 231-237. And hence, because the artery and fibre are alternately compressed and expanded, it follows that there is in us a continual combat between death and life; or, that death, by incessant assaults challenges life, and life by incessant victories subdues death, until finally, in that we are natural, we lie down in death, but, in that we are spiritual, we are restored to life. Thus, when we have paid the debts of nature, we conquer even when conquered.

159. *Therefore, by the animations of the brain, the respirations of the lungs, the systoles and diastoles of the heart, and the circulations thence arising, there is a continual renewal of life.* And therefore, as soon as the motion of the brain, lungs or heart ceases, the circulation of the fluid in the fibres and of the blood in the vessels also ceases; and when the circulation ceases, the life of the body ceases. This life, which is believed to be continuous, is punctuated with perpetual threats, and, as it were, alternate times of death; for every systole is the threat of death, and every diastole the announcement of life. These changes or moments are parts of the general life; and hence it is evident what lot awaits our life; namely, that our waning years must needs continually sink down by a declining path; or, that the parts involve their general in the same fortunes to which themselves are subject.



But to resume: Since our life is interrupted with so infinite a number of deaths, it cannot but be clear that that deserves to be called death rather than life, which is the cause of the darkness of our mind; a mind which then only lives when it is raised up from nature,—that is, from the world and its blandishments, and the body and its allurements, all of which are of themselves dead,—to God, who is the one only life and the sum of life.

**160.** *But between the arteries and the fibres there is a difference of velocity and perfection, or of moments and degrees, according to the laws of the doctrine of order.* The tenets and laws of the doctrine of order may be seen in Trans. I., chapter viii., [n. 633-652], especially n. 648. For there is such a co-established harmony of all things in the same series, that they mutually correspond to each other, with a difference merely of perfection according to degrees. Wherefore inferiors regard superiors as their analogues and eminences; and so also the arteries, the fibres, (*ibid.*, n. 626). The more simple substances also are prior and posterior, remote and proximate, and, among themselves, like efficient causes and effects. Those which are prior are also more universal, and in their every quality, more perfect than those which are posterior, (*ibid.*, n. 613-617). And, such as are the substances, such also are their essences, attributes, accidents, and qualities, or all their adjuncts, (*ibid.*, n. 618-621).

**161.** *The ratio of the conformity of the artery and the fibre, is gathered from the conformity of the fluids contained in them; for through the artery runs the red blood, with its accompanying serum, and through the fibre the purer essence of the blood, or the animal fluid; which two mutually correspond to each other.* On the correspondence of these animal fluids, see the explanation in Trans. II., n. 222, and the passages cited at the end thereof. In the meantime, if the fluids mutually correspond to each other; and if the tunics are so conformed to the nature of their fluid that the two together constitute one vessel and act as one cause, (*sup.*, n. 151, 152), it follows that it is from this circumstance we are to seek the ratio of conformity and analogy.

162. *But they differ in the following particulars, namely: that to all the arteries is prefixed one great heart; but to each and every fibre so many little hearts.* This is confirmed by microscopic examination; for from every single gland of the cortex a fibre is put forth, so that there are as many fibres as there are cortical parts. This is the reason why there is so great a luxuriance of the cortical parts, that they may be numbered by myriads. *Also that the arteries are continually ramified, but not so the fibres.* For fibres are girt about with a tunic of the most simple nature, or with a most delicate sheath, on which account they no longer suffer themselves to be ramified into branches; it is only nerves, or fascicles of fibres that are ramified. This also is the reason why so minute a heart or head is set over the fibres, while over the arteries of the body is set a great heart, in order, namely, that it may be equal and adequate to every ramification, that is, to the sanguineous system.

163. *Moreover, that in its extremity, the artery goes off into a vein; but not in the same way, the fibre.* That the artery finally passes over into the vein, is evident; it is not so evident, however, that the fibre does likewise. But from the comparison instituted above between the nature of the vessel and that of the fibre, we conclude that the vessel flowing into the spherule of the cortex, is a vein relatively to the fibre; for as the vein flows into the heart, so this vessel flows into the cortex, wherein it is united with the fibre, in a manner hardly different from that in which the vein is united with the artery in the heart. And therefore our statement, that the fibre does not pass into a vein in the same manner as the artery. How it does pass, here is not the place to say; but I might declare the matter in a few words and obscurely: A deep examination into the determination of the fibre makes it evident that the fibre constructs the arteries, and that the arterial thread thus constructed is infinitely expanded in the body into a glandular form,—a form not unlike the cortical,—a vesicle or a spherule, from whence is put forth a little duct or corporeal fibre that returns to the cortex by way of the inmost tunic of the artery. In this way the fibre is seen to go off into a kind of



corresponding vein. But of these matters we shall treat below, when we take up the corporeal fibre. *And, finally, that the circulation of the blood through the arteries is distinguished by the pulse; but not so the circulation of the fluid through the fibres.* And this because of the reasons adduced above, n. 148, 150, 160; that is to say, because of the imperceptible moments of velocity obtaining in the fibres.

164. *From this comparison we may be allowed to judge concerning the use of the vessel and the use of the fibre in the brains; that is to say, because the vessel, in respect to the fibre, is of a passive nature, and the fibre, in respect to the vessel, is active, (see above, n. 139-140), that therefore every compound part of the cerebrum, small and large, is made up of fibres, that is, of active parts, and at the same time of vessels, that is, of reactive or passive parts.* These two principles of nature, the one active, and the other passive, must be within every single compound; for what would active force do and effect, and whither would it be determined, if there were not something to resist and suffer? On the other hand, what would the passive and inert be, if not an instrument which might be used, and upon which, as upon its object, active force might spend itself? Active forces, therefore, taken by themselves, and passive forces taken by themselves, produce nothing whatever, nor do they mutually coalesce. Therefore, wherever there is a compound, there must be within it those two principles, which are here represented substantially by fibres and vessels. That we may know what passive force is, or the force of inertia,—this is evident from the definition given in Wolff's COSMOLOGY, namely, that it is the principle of resistance to motion in bodies, § 130; and that the force of inertia resists every mutation, § 132; for the definition of active, primitive, living or derivative, and motive force, consult the same author. By passive here is not meant that which is wholly inert, or which, of itself, becomes absolutely quiescent; but that which is relatively less active, and which to other and more passive entities, may be quite active; as, for instance, the veins of the body in respect to their arteries, and, in the present case, the vessels, in respect

to their fibres; or, to use an analogous example, as a consort in respect to her husband. For reaction is likewise action, although they are opposed. That no compound or offspring which is a substance by itself exists without these two natures rightly consociated with each other, is clearly enough evident from the members and parts of the animal body, such as the brain, heart, lungs, stomach, muscles, glands, arteries.

165. *And thus that the vessels constitute the surface of the compound part, while the fibres constitute its body.* For these forces are usually so consociated, that the active reside in the center, and the passive, resistant, reactive, obsequious, or more or less inert, are rejected to the peripheries. Indeed, very frequently they are in such order of succession, that the activity of the center gradually decreases towards the peripheries. But let us be enlightened by examples: The cerebrum stores up interiorly in its hemispheres, its most active parts or very forces substantiated, if I may so speak; that is to say, the cortical glands and the fibres. These it covers over and encloses first with a delicate mater [the pia mater], then with a hard [the dura mater], and finally with the inactive cranium. Nor can it be doubted but that each single part of the cortex, and each plexus, and also each fascicle of fibres, and each nerve, is coherent in the same manner, for each one of them is girt about with its own membranes. In the nerves, fibres constitute the axis and vessels the membrane. So also in the heart, where the veins are rejected to the surface; that the coronary vessels are all veins, see Trans. I., n. 421, 422, 459. In the arteries and veins, likewise, in which, as was shown above [n. 139, 140, 153], there is action and reaction, or an active force and a passive. So also in the lungs, which are coerced by the pleura and ribs; and, moreover, in the stomach, pancreas, liver, spleen, and the rest of the viscera; and still more plainly in the glands and muscles, for these are enfolded in a manifold series of membranes.

166. *Hence arises a natural tempering and a limited extension of forces; and a series is born, wherein the centre is regarded by every point of the surface, and the surface by the centre; a series which limits the inscated forces to within*



*a determined sphere of activity, and sustains, coerces, weighs and governs them.* That this is not mere reasoning or vain conjecture, is confirmed by experience. For in the cerebrum the vessels everywhere form a membrane, according to the testimony of those clear sighted anatomists, Malpighi and Leeuwenhoeck. The same is also plainly visible in the fascicles of fibres that emerge from the medullary stem; for interiorly these fibres are bound together, and exteriorly they are girt about by the pia mater and afterwards by the dura mater. It is likewise visible in the arteries, and also in the fibres; these being interiorly permeated by fluids, which are the forces of nature in form, and exteriorly coerced by tunics.

167. *In this way, vessels are present everywhere in the medulla of the cerebrum; from which it follows that wherever a fibre or active force is lacking or begins to be lacking, there the vessels raise up a new cortex or cineritious substance (from which spring forth new fibres or new forces), according to every ratio of composition in the beginnings of the nerves, and according to the use in the extremes.* This now, is the reason why active substances, such as the cortical substances and the fibres, are so abundant in the brains that they must be numbered by the myriad; and likewise the vessels, which are infinitely ramified; and also why the cineritious parts abound, not only in the circuit of the cerebrum, but also in its interior medulla and in the corpora striata. That these cineritious parts are raised up anew, branch out and are perfected, yea, that they die away and are abolished, is testified to by a thorough examination of the brains of the dead. In puppies, according to Willis, these substances hardly as yet appear; and in brains worn out, and also in those which have been weakened by venery they are seen to disappear. But to continue: The very necessity of the offices and use in the extremes demands that the cerebrum here hatch out new forces and there obliterate the old as useless. But to describe all these changes in animal kingdoms is to descend from universals to special and particular points, and to spread out from anatomy to the pathological phenomena of the body and animus.

*(To be continued.)*

# THE NEW PHILOSOPHY.

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## Editorial Notes

### THE WORK ON GENERATION.

At the present time of writing the revision of the English translation of Swedenborg's work on GENERATION is completed as to one-half of the work. After disappointing the subscribers last Christmas, for reasons which we have already explained, we prefer not to make any further promises, but the subscribers may be assured that the work is in active progress and will be pushed with all zeal to final completion.

One part of the work indeed will probably be completed by the time this comes under the eyes of our readers. We refer to the making of the plates that are to illustrate the book. These plates, of which there are nine, have been drawn by Mr. Ludwig E. Faber, the excellence of whose work is sufficiently guaranteed by the work he has done in the illustrating of Piersol's ANATOMY. It is gratifying to know that the work on GENERATION will be furnished with plates, as undoubtedly they will greatly facilitate the understanding of Swedenborg's text.

Dr. Boericke has been encouraged to include these illustrations in the work, by the response with which his original offer has been met. Thus far one hundred and forty-five copies have been subscribed for, a few subscriptions having been received since our October issue, as follows:

Previously reported, . . . . .	139	Marelius, Dr., Chicago, . . . . .	1
Blakiston, D. G., San Fran-		McLaughlin, S., Los Angeles, 1	
cisco, . . . . .	1	Merril, W., Cincinnati, . . . . .	1
Crane, Thos. S., New York, . .	1	—	
Dill, Dr. E., Los Angeles, Cal.,	1	Total Subscriptions, . . . . .	145

## THE SENSES.

TRANSLATED BY E. S. PRICE, M. A.

CHAPTER VII. (*Continued.*)

**597.** *From these, articulate sounds are formed, which agree with the interior sight or the imagination.* 1. These articulate sounds express those things which result from the prior elements by the imagination or by new composition. 2. These sounds must be called artificial, for they involve more things than sight nakedly grasps, or than it grasps in a moment. 3. Words are formed according to those things which are included therein, 4. which are especially classified among artificial things, 5. that effects and the phenomena thence detected, 6. delights, appetites and affections may especially spring forth from the field of the imagination; 7. also the effects and states springing from them, and more things. 8. This is the second class of articulate sounds, 9. which, nevertheless, that they may be understood ought to be referred to the prior things by which they are formed, and by the aid of which they fall under the understanding.

**598.** *From these again, articulate sounds are formed, agreeing with inmost sensation, or with the intellectual sight of the proprium; these sounds result from things imaginative or artificial.* 1. These words go still more deeply, 2. nor can they be expressed in the beginning except by a combination of many words; 3. and they express something higher, which involves *infinite things*. 4. Thus they put off, as it were, the material habit, and put on the immaterial, because they involve infinite things; 5. as for instance, substances, essences, forms, accidents, qualities, modes, good, evil, and the like, which are endless, and in their complex are not bounded. 6. These words are *scientific* and are proper to the understanding; 7. yet they have been hatched out from things prior or imaginative, for they are founded in them, and are to be defined, explained and demonstrated by them. 8. These words form the superior or



philosophical speech. 9. Thus we ascend to superior things, just as do forms, of which in the doctrine of forms, always by the addition of something of infinity or perpetuity. 10. But yet these things cannot be understood unless we fix our intellectual ideas in imaginative ideas, and these in sensitive. 11. The modifications or combinations themselves also ascend in like manner; 12. as acting, doing, and many more, in which there are also infinite things, 13. they can be likened to an equation in which there are infinite things which can be evolved.

**599.** *These articulate sounds in the interior sensory are called ideas, and they are sensual, or imaginative, or intellectual.* 1. All articulate sounds, because they have reference to some mode grasped by sense, are referred to a kind of sight; 2. for sight judges of the rest of the senses, because it judges of their sensories. 3. Ideas are purely emulous of the visual, when the imagination produces the object of sight just as they were received by the eye, as houses, cities, fields, gardens, armies, men, different facts, machines, visual phenomena, and many effects, even those represented in type, actions, motions, the very songs of the hearing, and many more. 4. These are rather images of interior sight, for the eye sees nothing, but is the organ of sight. 5. But indeed the proper ideas of the imagination are deeper, and participate in a higher or intellectual power, so that they are mediate between intellectual and visual ideas; 6. as when we make a different arrangement in the imagination of things seen, 7. of the things harmonic in architecture, optics, music, and other arts; while we beat out new harmonies from things seen, which cannot be done, except by help of a superior faculty; 8. while we not only represent delights such as have been seen, but also set up another series of delights, that they may delight the more, and more variously; 9. so that if we represent the appetites of nutrition, or love, or any other amenity of sense, we represent them not only as they have been seen, or by a sight of what was represented in those things which were enjoyed and bounded in that appetite, but we throw together still more modes at the same time and dispose them into another order, to the end that the appetites may

increase. 10. Thus in affections, as in fear, wrath, gladness, the appetites are not represented such as the gestures and countenance have appeared, which would be only historical or visual, but we also bring together more things besides, and reduce them into order, in order that something similar may be excited, which is done in endless modes. 11. These things cannot be brought about without a superior faculty, which shall come to the assistance. 12. Likewise the imagination reduces all the particular modes of one species under a certain general species, indeed it also reduces those things which pertain to the species, into order, and thus harmonizes its own ideas; but with the aid of the superior faculty. 13. But intellectual ideas are superior, for they take into consideration only *generals* or things which *embrace* under themselves several species, according to every ratio of the operation of generals, as also *universals* which enter into all things which the generals embrace. 14. Furthermore those ideas are gifted with their own articulate sounds, such as quantities, qualities, forms, etc. 15. Thus one passes continually to things more unbounded, *and to generals which embrace or involve many things, as also to universals which enter into many things*; thus to every sphere is given its own proper or more universal. 16. Particular ideas form a general idea, and general ideas form a more general or most general. 17. General ideas, then, go back to particular ones, and dispose them in order, that they may agree. 18. Thus singular ideas form the universal idea, finally the more universal, 19. and the more universal ideas go back to particular ones and examine them in order, according to those universalities. 20. Thus the parts are first insinuated, then the species of the parts, and finally the genera. 21. In general we examine the species and the parts subordinate to them, first generically, then specifically. 22. Generals and universals of prior things steal in, but the understanding cannot take cognizance of them until more parts have somewhat entered into the species, and more species into the genus; then first the mind operates, and forms its idea. 23. Thus it appears how all things ascend, namely, to universals, in which all the particulars lie hidden; and to generals, under which all the parts are



held; or to genera under which are all the species. 24. There is, therefore, a kind of elevation by degrees. 25. In every degree there is something of what is infinite; for infinite species are in a genus, and infinite parts in a species. 26. Thus then a part is assumed as something general and universal, and in it we again consider the species and the parts, and so forth. 27. From this it appears what a visual idea is, that it is the emulous or imaginative of the visual; and what an intellectual idea is; 28. and that always something of the infinite or perpetual is added in the ascent; 29. according to the doctrine of forms.

600. *Those ideas are merely changes of state in the organic or cortical substances.* 1. They are the true substances of principles, for from them all things flow to principles. 2. The senses themselves, especially that of sight, produce changes of state like their own images; 3. the ideas are emulous of visual things. 4. Those changes induce a change, not only upon the surface, but upon the whole interior cortical substance, thence arises a general change of state. 5. All those substances sense this change in singular, thence are all general intellectual changes. 6. Wherefore the changes of state among the cortical substances are to be considered, especially those of the cortical substance which are imaginative; 7. then the changes of every substance which are intellectual. 8. That those changes are the same as ideas will appear in the discussion of the cortical substance; 9. then that infinite changes of state can be induced, and indeed all the series of them, to the extent that they become ineffable, will be demonstrated by induction.

601. *These changes of state are impressed in the same way as the ideas of the memory;* 1. for every cortical substance is in the potency of receiving diverse changes. 2. Changes induced by the posterior or sensual way are permanent, 3. and finally they become from culture, as it were, natural. 4. As often as these changes of state are excited, so often ideas of the memory are excited, thence is imagination; 5. if the ideas be superior, thence thought is excited. 6. Therefore, since all things in us progress by the posterior way, those organic substances are in the potency of the changes, 7. which are induced by sight, from the imagination, and from thought; 8. and, be-



ing induced, they remain under the guise of ideas; 9. for that all thoughts are changes of state, is confirmed by all philosophy; 10. but that such changes really exist, and indeed in an eminent organism, has not yet been demonstrated, 11. nor can it be demonstrated until the brain shall have been scanned, and it shall have been taught what changes of state are, what superior and inferior forms, what order and degrees, and more besides, concerning which in the proper doctrines.

602. *Therefore the memory is the campus which the external senses establish, as also the internal; 1. so that the memory may be an interior world, 2. in which lie hidden all those objects, which have entered the senses. 3. From this campus can be produced those things which have entered from beneath, 4. not only from the external senses, 5. but also from the imagination, as also from the understanding. 6. Wherefore the memory of those things which rise above the sphere of the senses is to be called the superior human memory; 7. and that which rises above the imagination is to be called the supreme human memory. 8. Thus the memory is distinguished into its own degrees; 9. for it is only change of state or of the common organic cortical substance, 10. or of those single parts or substances. 11. The whole memory exists at once; thence the mind is more visual, more imaginative, more philosophical or rational; 12. but how they concur, remains to be seen.*

603. *That those changes of state, as soon as they are induced, are produced partly by causes which excite the senses, wherefore by the senses, partly by causes which are excited by the body, wherefore by the body, is known. 1. This does not need demonstration, because it is obvious; 2. for the sense, especially that of sight the images of which had formed those changes, excites those ideas; 3. similarly the pleasures of the body, and many things in the body which excite the blood into its modes; 4. wherefore the affections of the body, as the constitution of the blood, the superfluity of the spirits of venery, hunger and thirst for food, and many more. 4. [a] Thus there are two causes of excitements, namely, from the world and from the body.*

604. *But the ideas of the memory which are imaginative, excite the intellectual memory, wherefore the thought of the understanding.* 1. This also is known to everyone; 2. it is the interior principle now separate from the exterior; 3. for it proceeds from the interior campus.

605. *But ideas, whether sensual or of the memory, whence-soever they come, do not excite anything else than a perception or sensation of those mutations;* 1. for thence is sensation, which does not exist except from causes extrinsically impulsive; 2. but because every organ of sensation can change its states, 3. and changing the state comes forth from a superior power, 4. thence from the soul, 5. the soul can therefore excite diverse states; thence is thought; 6. which is an active force put forth from the power of the soul; 7. thence perception or inmost sensation passes over into thought; 8. indeed, as in music, one thought excites another, and indeed in a continuous series. 9. Thus from one object can finally be formed infinite things which are coherent. 10. Therefore it is the part of the body and senses to excite sensation, yea, affection or like changes. 11. But indeed it is the part of the soul to produce the changes, or to impart the force of potency, 12. and to cause all like changes and concords to run through. 13. The rational human mind imparts force to the imagination, thence from memory arises imagination: and the soul imparts force to thought. 14. On this account the exterior and interior faculties concur; 15, and they concur in the rational mind, as in a kind of centre. 16. *Wherefore the interior faculties, are, while they are excited, what produce those changes of state,* and they all turn in such order, that the desired form may exist. 17. Thence is thought. 18. Thence passive thought is sensation which is reproduced, or the mere memory of those things which are then represented. 19. But active sensation is thought which is produced by the soul. 20. This we can see from the fact, namely, that thought can produce itself, but the last idea produces a new thought, and this another similar one, and so forth; but similar and concordant, which is the nexus. 21. The soul is what is in the spiritual world, and takes cognizance of superior and spiritual con-



cords. The soul gives the faculty of reproducing. 22. Thus it produces similies and concords, but according to the loves of the mind. 23. Thus analysis is formed. Obs: but *these things are obscure; I have not a distinct idea of them.*

**606.** *Articulate sounds or words naturally induce no idea correspondent or harmonic to the sound, but they are only signs by which, when uttered, this or that idea is produced.*

1. An articulate word has in itself no correspondent or harmonic idea, as does a singing sound. 2. The same idea is exactly the same whether it be expressed by this word or that; 3. or if a contrary idea be expressed by the same signs; 4. as if horse, house, motion were expressed by a thousand other words, the same idea occurs; 5. indeed, if motion should be expressed by rest, good by evil, and so forth, 6. or if these things were expressed by signs of the fingers, or by gestures, or touch, or a letter written in Latin or Arabic, still a like idea would arise. 7. Therefore there is no pre-established harmony between these articulate modifications of sound and ideas, as there is in harmonics. 8. A word not understood does not enter deeply, but remains a bare sound.

**607.** *But the superior faculty or soul concurs, and excites that change of state or that idea which agrees with the given sign.* 1. The excitation of an idea does not therefore depend on a word as a sign, 2. but on the perception of the soul as to what the sign signifies;—wherefore that perception induces that idea or change of state. 3. Wherefore there is indeed a concourse, not a harmony. 4. Although it would seem from the fact of cultivation, whereby a nature is as it were induced, that an idea is excited by a sound, or that there is a kind of natural correspondence; 5. but still it is evident that there is no natural correspondence but an artificial one, or one made by art.

**608.** *Therefore, between words and ideas, as between letters seen and ideas, there is no pre-established harmony, but there is, as it were, a co-established harmony, by which the one occurs to the other from a given sign.* 1. For if it were pre-established then there would be but one language in the universe; 2. in order that anything pre-established may be in it; but by con-



nection, therefore, the words are so pronounced that they may put on a kind of natural harmony, 3. and thus emulate the kind of affection which is intended to be produced.

609. *One imaginative idea excites another, not by any pre-established harmony, but by a harmony brought on and induced by usage and culture, or by one received through the senses.* 1. For as an idea is only a change of state in the internal sensory, 2. and changes of state are simple and compound, 3. and in every possible series, 4. hence one compound idea embraces under it innumerable particular ideas and one particular idea has reference to other general ideas. 5. Thus the sign being given, and the idea excited which agrees with that sign, this then excites all those ideas which belong to the same series; 6. or which are inserted in that series. 7. But no idea is excited except that which has previously flowed in through the senses, and has been subordinated to the general; 8. wherefore, when the idea of the general series is excited, the equation is, as it were, solved, then it goes forth thence in the order of the particular. 9. All particular ideas which go forth, have been inseminated by culture; others cannot be excited, although they can be fabricated by means of the understanding. 10. Thus the general is the product of the particular ideas, and the particular are the product of the general ideas; for they are in the same change of state, because they have been inserted; 11. wherefore, in them also appears a co-established harmony. 12. Otherwise all would perceive the same thing, and like ideas would be produced by the general or other particular ideas, which never happens. 13. This happens in brutes, in which there is nothing rational, but only natural; no speech, but only affections, to express which is their speech. 14. Thus neither in our imagination, strictly speaking, is there any influx, nor any which can be called physical because it is not natural, nor spiritual, because the soul alone gives to the imagination the faculty of unfolding and variously infolding its states and ideas.

610. *Every visual image in the beginning produces in the campus of the memory or imagination some general or universal idea, but without particulars, and, therefore, an obscure*

*notion, into which, in the process of time, enter particular ideas, which thus perfect the general notion.* 1. This is evident from experience itself, as to how we learn to know things. 2. At first we know things as a kind of indistinct chaos; 3. as the universe without stars, as suns without planets, without their notion. 4. Afterwards the parts enter, and indeed parts within parts; 5. thus the general is perfected. 6. At first we perceive a tree, before we recognize the species, and the species before we recognize the specific character in the species. 7. Thus in the animal and mineral kingdoms. 8. But as the nature of many species, and of their parts accedes, so the notion is perfected. 9. All these things place and subordinate and co-ordinate themselves in order under the general notion; 10. indeed in an order, whatever species one regards as a general the species of which it forms; 11. exactly according to the order of nature, where there is nothing that is not in a series in which are genus, species, parts and degrees. 12. This can be demonstrated organically in substances.

**611.** *Whatever has entered into a general notion of the imagination, that, by a power induced by the soul, is called forth when the general idea is excited; indeed also vice versa.*

1. Therefore, nothing is excited except what had previously entered by culture or through the senses, 2. and indeed then by a turning and activity of the states, when they are suitably changed. 3. In every single general state are many particulars, 4. as in one equation there are infinite ratios and analogies, or minor equations.

**612.** *Every general idea of the imagination distinguished into its parts excites the more general, which is an idea of thought.*

1. For a general idea of the imagination corresponds to a more general idea of thought or of the understanding; 2. as while that which is delightful, desirable, longed for in the imagination is excited, that excites what is good in the thought; good is the general idea of all those things in the imagination, for it embraces them all. 3. Thus many generals of the imagination together are reduced under one notion of the understanding. 4. The reason is that every change of the general in the imagination, or in the cortical substance of



the interior organic substance does not stop until it comes to some individual cortical substance thereof, upon which it induces a like change of state, which is then more general or more universal.

**613.** *But this general, thus excited in the understanding, is still obscure and indistinct until its particulars or singulars have entered in.* 1. This is brought about by knowledges, 2. and in process of time as we become rational. 3. Until particulars or singulars have entered in, we possess no general notion, we scarcely know that anything is; 4. we know, not rationally, but only imaginatively, as for instance in knowing good; unless we know how rationally to distinguish goodnesses, we do not know rationally what good is regarded in itself.

**614.** *But as singulars enter in, so the general intellectual is perfected.* 1. Just as has been said of the ideas of the imagination, general and particular; 2. these ideas do not enter of themselves into the understanding, but must be added; 3. wherefore they must be added by knowledges, especially theoretical knowledges. 4. Thus the general intellectual, *being excited, calls forth the singulars*, 5. wherefore not by and pre-established but by a co-established harmony in usage, culture, the sciences and so forth.

**615.** *From these things the nature of the human order of learning, knowing, understanding and being wise is evident; that is to say, that it is analytical and inverted.* 1. For at first generals are formed, 2. under these generals, particulars are arranged. 3. Particulars perfect the general; 4. thus in the general we perceive singulars; 5. but in process of time, when the understanding is more perfect, or when it has progressed by the analytical way, then it returns, as it were, by the synthetic way, 6. and proceeds from particulars to generals, from singulars to universals; 7. and thus order is then truly established; then particulars produce their own general. 8. But if the order be not well established, then such as are the particulars, or such as are the principles, such are the generals thence evolved; 9. wherefore we must not descend before we are in truths themselves from particulars which have been explored.



10. It is sufficient, then, to go by the way of generals; 11. for thus particular truths place themselves therein spontaneously, 12. and indeed by the affections, as has been said above in the article on the affections. (But these things are still obscure.)

616. *In a word: From articulate sounds, or from the mere speech of words, there is excited in the brain a kind of tremiscence among the parts of the cortical substance, which since they cohere in a mutual connection, and at the same time are associated by the pia meninx into a community of consorts, there is none of them but becomes participant of that tremor, which by the order of succession, according to the connection, of which above, penetrates even to inmosts, and therefore, to the soul, which receives the sensation of it. These sounds or words taken singly are indeterminate modes, but still in a diverse manner they are determined into a certain form. Speech thus consisting of articulate modes cannot of themselves excite any correspondent idea in the external sensories, for one thing expressed by innumerable words, still excites the same idea; wherefore it is the soul, feeling this, which induces such change of state of its organic substance, as the connection of the words or the speech signifies; therefore such an idea is excited by the soul, for there is nothing naturally harmonic in a word and an idea. Thus for every articulation of speech the soul concurs with some change of state in the intellectual sphere. The soul does not excite a sphere except the one proximate to itself, or the intellectual sphere, but not one more remote, or the imaginative, except by its own intellectual sphere; for all things proceed in order: Such therefore as are the states previously induced by ideas, such are the spheres that are excited; for otherwise it would not be known what was said. Those generals and universals which are in words, and which by composition of many things are determined into a certain rational form, call forth all those things, or part of them, which involve the generals; and those singulars call forth those things which enter into the universals; thence the idea is determined by the one understanding, and indeed the more fully as the more things have entered into the memory; for no other things can be called forth than those which have*

entered by the analytical way, and which have been connected under a certain general bond as universals. But how these single things bring about the effect by changes of state, is difficult to explain to the comprehension of anyone, until the cortical substance and its texture has been explored; and this is not fully understood unless the doctrines which we have promised carry forward the torch. Therefore it is evident that there is no harmony unless you wish to call it co-established and by this understand concourse; for there is a concourse of ideas with the words of speech; and that the soul excites those changes of state or ideas which the understanding has learned, by usage and culture, correspond to those articulate sounds; nor is there an influx of vocal sounds into ideas harmonic and natural, but it is acquired by art. It must be said of the soul that it excites those correspondent ideas, as its rational mind has been taught; for the soul is constrained to follow whatever the rational mind commands, for it is subject to the arbitrament of the mind. But the very ideas as they have been formed, or the changes of state, do not excite general ideas, but call forth particular or singular states, as these have been subordinated by culture to their general ideas, and these have been co-ordinated among themselves, and this by the active power put on by the soul of running through infinite states in a moment, and thus of revolving and turning the single things which have been subjected to generals. This calling forth is accomplished by co-established harmony. As is the connection which singulars form among themselves, such also are the generals which the series of the singulars involve, limit and terminate. Thus in speech subjects are similarly formed as in all the rest; but this amplified is the rational matter of all philosophy. See the dream of July 1-2 [n. 592].\*

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\*The dream here referred to is recorded in Swedenborg's DREAM BOOK, where we read:

"July 1-2. Something very wonderful happened to me. Violent tremors came over me, one after

another, as many as from ten to fifteen—just as when Christ manifested to me His Divine grace. I expected to be thrown on my face, as happened the last time, but I was not. With the last of these



## THE UNDERSTANDING AND ITS OPERATIONS.

617. We have treated of the understanding or of its sensitive faculty, which is called perception, and of its rational activity, which is known as thought, or whence and of what quality it is; we now come to the conclusion, and we shall embrace in a short description why, or for the sake of what end, it is.

618. *Understanding, with its faculties or rational mind, has therefore been granted to the human race.* 1. The faculties of the understanding or of the rational mind are, 2. first, perception or *inmost sensation*; 3. then thought or the *turning* of rational ideas, and, as it were, analytical computation; 4. then *conclusion*, which is known as decision; 5. then *choice*, thence is will, for what we choose we will; 6. lastly is *determination into act*. These are the parts of the human understanding. 7. The *first part*, or perception, is inmost sensation

tremors I was raised up; and with my hands I felt a person's back; I passed them over the whole back, and over the chest below. Immediately the person lay down, and I saw the countenance in front, but very obscurely. I was then upon my knees, and was considering whether I should lie down beside him; but did not, as it did not seem permitted. All the tremors commenced in the body below, and ran up to the head. This took place in vision, when I was neither awake nor asleep; but when I had all my thoughts collected. The internal man separated from the external felt all this. After I was fully awake, several tremors similar to the former passed over me. It must have been a holy angel, since I was not thrown on my face. Our Lord knows best what all this means. It seemed to me as if I

had been told before, that I should have something for my obedience or for something else. God's grace is exhibited towards both the internal and the external man with me. To God alone be glory and honor!

"From what followed and from other indications I perceived that it signifies this: That I shall discover the truth about internal sensations, but on the back, and obscurely as to their front. For before this came over me, it seemed to me as if I had been told that this was an announcement in respect to what I have hitherto done; afterwards also it appeared to me, as if it had come to a point when my mean stivers were exchanged for better coins; then also a little gold was given me, although there was some copper among it." (2 *Documents concerning Swedenborg*, 198.)



arising from the ideas of the memory, especially from ideas already concluded from material things, which are then called reasons or already formed analyses. 8. These pervade even to the inmost, which sensates, and thence follows a suitable change of state in the inmost sensory. 9. The *second part* is thought, which is the revolution and turning of the states thus induced, or it is the active state by which all those things which are similar are traversed and thus terminated into like things; whereby new things are called forth from the memory, and new states thus induced; thus multiplied. 10. The *third part*, or conclusion, is the very analytical form formed by these things; indeed, the one form is in the other; for from perpetual forms as truths, one concludes what is formed in almost a like manner as in an algebraic equation; for the concluded form is an equation, in which there are many ratios, analogies, and therefore equations. 11. The *fourth part* is choice from many things concluded; otherwise if one thing were concluded the conclusion would coincide with the choice: 12. especially some general end or love would reign, of which there has been a conclusion, so that choice would be the only means to that end; but it is peculiarly intellectual first to explore the general end in which it may rest; second, which one all the rest of the ends follow. 13. The *fifth part is determination into act*; the above intellectual is in this, that it may explore, judge, and choose the means which tend to that end. 14. Then in what order, in what time, in what manner, those things are to be determined is the explication of the equation. 15. Thence is action, in which is the rational, which had been in the choice or will. 16. In this manner proceed the aspirations of the mind. 17. It is similar in the other senses, but with a difference of perfection, distinction, and objects, wherefore also of subjects, which lead up to the ultimate act.

619. *In order that one may explore truths.* 1. The first intellectual is to explore truths; 2. and from many to separate one general truth; 3. from many generals again, more general truths, and so forth; this goes on even to the infinite, where it must by all means subsist, and come to rest there: 4. for the rational mind cannot progress outside its own sphere

through these limits, wherefore neither above them. 5. From that form quality results, whether, to wit, it be perfect; wherefore perfection shines forth, which is goodness. 6. From goodness is affection. 7. Therefore truths are the determinations of the form in which goodness may be. 8. Thus we proceed by the analytical way from the body even to the soul. 9. When good is received, or judged then it reigns like a soul, 10. and prepares determinations for itself which are its truths, 11. and thus constructs and arranges for itself a body or system; 12. these determinations all have respect to the good received as to their own beginning, or as to a soul. 13. Thereafter the mind proceeds by the synthetic way, 14. and, as it were, creates a new system; 15. in order that the mind may be in a kind of perpetual creation, so that it may pursue that which its soul intends.

620. *We explore universals from singulars, and generals from particulars.* 1. Universals enter into everything, and they involve generals. 2. All ideas which are called forth from the campus of the memory into the intellectual sphere, or which flow into it, are universal and general, which are successively determined; 3. for thus one must progress towards interior and superior things. 4. Generals and universals are effects and phenomena; they are also the laws of many sciences, physical, philosophical and geometrical, which having been explored are now truths. 5. But universals are not explored as to what quality they are except from singulars, nor generals except from particulars; 6. hence singulars and particulars are to be obtained, from which the quality of universals and generals is indicated. 7. These give the understanding of generals and universals. 8. Hence the understanding does not rest in these generals or universals, which are from the campus of the senses and the memory, inasmuch as they are piled upon what is fallacious, but it revolves and arranges the singulars and particulars called forth thence, by means of laws, which are truths, and thus forms for itself generals, which correspond to the particulars, and universals which correspond to the singulars; 9. thus it proceeds by an analytical way, for particulars rightly co-ordinated to them-



selves ought to form their own general, and singulars ought to progress even to their own universals; 10. and this in all subjects of whatever nature they may be; 11. but indeed while the general and the universal have been thus sought out; then those things reign in the whole series; 12. and the soul, as it were, determines its own singulars into a decorous form, which involves a common bond. 13. This is done by a synthetic way. 14. Let there be in place of an end some goodness which has been explored; 15. then that good, as a soul, as it were, perpetually regards the end, 16. and determines singulars or essentials in a suitable manner, 17. and closes the sphere or form with its own limits, that it to say, under a common bond, in order that there may be an ens distinct from the rest.

**621.** *Wherefore causes from their effects or priors from their posteriors.* 1. Effects are the forms of essentials determined by their own universals, 2. connected and bound together by the general, whence is the limit of their determinations, wherefore also, in compounds, their figure. 3. In every form universals superior and inferior have been determined, that is, priors and posteriors. 4. Those things which are prior actuate the cause of posteriors; 5. but principles actuate the first cause. 6. It is nothing but effects or posteriors which first reach to the sphere of the mind; 7. but those things being discussed, which enter into and constitute like effects, it analytically explores causes, 8. and finally from causes, principles. 9. But after the end has been received, then in order that there may be some goodness, that end, as it were, actuates the soul, 10. and then the mind prepares for itself forms suitable to that soul, 11. and arranges singulars into a decorous order; subordinates inferior universals to superior ones, and thus weaves them together and hedges them about with common bonds, 12. and thus concludes their rational forms, 13. exactly according to the order of the creation of the macrocosm or microcosm, 14. which, in order that it may be a type, is represented in every operation of the mind.

**622.** *Genera from their species, and species from their individuals.* 1. As superior universals enter into and deter-



mine inferior universals, and these the lowest: so genera in respect to species, and species in respect to individuals; 2. thus the blood is a species of the purer blood, or the blood vessel is a species of the fibre, and this a species of the simple fibre, which is a determination of the soul. 3. At first only genera enter into the perception, then the species of the genera, finally the individuations of the species. 4. The mind, therefore, while it at first snatches the genera, then examines the species, in order that it may know the genus. 5. Thus from the species it forms its own genus, as from particulars its generals; 6. likewise from individuals, its species. 6. [a] But indeed while it is proceeding by a synthetic way, or when the mind has been instructed and begins to return, then the genus, as it were, represents the soul, from which it forms its own species; and from these, the individuals.

**623.** *Thus varieties from differences;* 1. for there are generic, specific and particular differences. 2. At first general varieties enter in, then particular; 3. but the mind examines varieties from differences, otherwise it could not see the differences between varieties; 4. and indeed it does this by either the geometrical or the philosophical way by degrees and moments; 5. but afterwards the form and determination being posited, the varieties are placed and arranged according to the determinations.

**624.** *And wherefore qualities, accidents and modes, from essences and the nature of the operations.* 1. Every form takes on a quality according to its determinations; 2. thus it is more perfect or more imperfect. 3. The distinction of perfections is quality. 4. From quality results affection. 5. As are essences, such also are accidents. 5. [a] Modes are varied, while an essence is permanent; from modes the nature is known. 6. Essences are what first enter the perception. 7. But the understanding examines the qualities of an essence; for essential determinations arrange the forms, also all analytical forms; 8. but afterwards, in inverse order it establishes essences, and presupposes qualities, or of what quality the essences ought to be, to lead through to ends.

(*To be continued.*)

## THE FIBRE.

## CHAPTER IX.

CONCERNING VESSELS OF A MIDDLE NATURE,  
THEIR ORIGIN, NATURE AND FUNCTION IN  
THE BRAINS; AND CONCERNING COR-  
POREAL FIBRES.

168. *Vessels of a middle nature are those stamens of which the tunics of the cerebral arteries consist, and of which the pia mater is contextured.* The cerebral vessels of which we have just treated, however much, after entering the cerebrum, they may have transcribed their arterial nature into a nature similar to the venous, that is, into a passive nature (n. 138-140), I yet wish, in the following pages, to call arteries; and this for the reason that they are continuations of the arteries of the body; and, in anatomical matters, it is very desirable that there be no rash departure from a usage of speech, or a term that has been once introduced and received, however unsuitable the term may be. That these stamens are not vessels, is evident from the fact that they constitute and contexture tunics which are extended continuously with the vessels and their branches; for a branch, pierced by a cavity, cannot finally become a stamen, unless it be reflected back over an artery. Nor are the stamens fibres, since fibres spring forth from their cortical glands, from which they are drawn out as appendices. These stamens of the tunics are closely cognate and homogeneous with the stamens of the pia mater; and that the latter are of a similar origin and nature, will come to be demonstrated below in the Transaction on the Pia Mater.\*

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\*A Transaction on the Pia Mater was intended by Swedenborg as part of his *ECONOMY OF THE ANIMAL KINGDOM* series; but no Transaction or chapter on this subject is contained in the present work. In a large manuscript on the Brain, however, one chapter is devoted to the pia mater;

and, in addition, Swedenborg wrote two shorter treatments of the same subject, both of which are included in the English translation of the work on *THE BRAIN*. To this work, therefore, n. 410-419 *h*, and particularly, n. 419 *e*, the reader is referred.—TR.



169. *For when released from their membranes, they are of the utmost delicacy, and look like fibres.* On this account, Leeuwenhoeck, who was the first discoverer of these vessels, styles them fibrils of the cerebrum. How ineffable is their abundance and fineness is frequently mentioned and reckoned up by this author in his observations. And, because they intermingle with genuine fibres and genuine vessels, they cannot readily be distinguished from either. Nevertheless, we may still follow and discern them as disclosed by the mind as our eye.

170. *But because they are not fibres, nor vessels such as we have hitherto treated of, but are of another origin, nature and function, therefore we call them vessels emulous of the fibre.* Of their origin, nature, and function, we shall treat in what follows. But before we proceed, it is necessary to acquire a clear idea concerning vessels of this nature from Fig. 9, and the description thereof, n. 37, 129; otherwise, I must needs speak things obscure and but little understood; not unlike those who talk Greek to persons who do not understand Greek, and yet the same matters are set forth clearly enough in that language,—but to those who understand it.

171. *These vascular, or if you prefer the word, fibrous stamens, are those stamens, taken from the tunics of the arteries, which produce, restore, and irrigate the cortical glands, that is the whole cineritious substance of the cerebrum, cerebellum and both medullas.* From Transaction II., in the chapter on the cineritious substance of the Brain [n. 69-207], it is, I think, sufficiently well established that this substance is the principal substance of the animal kingdom. There can be no doubt but that the cortical substance is so connected with the vessels of the cerebrum that one might naturally believe its glands to arise from these vessels,—as, indeed, is asserted by the most experienced anatomical investigators, such as Malpighi and others. One point, however, must be called into question, namely, whether or not the cortical glands are terminations of the arteries. That is to say, Do the arterioles in their extremities end in a gland, wherefrom is born a continuation which is a fibre? Or, does the arter-



ial vessel, while continuing on its path, produce such off-spring from its tunic, and yet itself go on further as an artery? The analogous example of plants or fruits gives us reason to conclude, that, probably, the above mentioned glands do not frondesce from the arterioles direct, but that they do this from the tunic or membranous part of the vessel. In plants and trees, or in the vegetable kingdom, it is quite clear that the first germs or buds of fruits blossom, not from the wood, but from the soft bark of the twig, as is plainly seen in grapes, berries, mulberries, strawberries, cornel cherries, and other vegetable off-spring. The same is still further confirmed in the case of broken and fallen trees, which still give forth vernal flowers and fruits, even when only the bark remains. Not unlike these, may be the fruits in the animal kingdom, that is to say, the cortical spherules which are the last off-spring of the sanguineous vessels and the first of the fibres. This is taught by comparison; for in these and similar matters we may be allowed to compare the animal kingdom with the vegetable. The shoots or branches of trees correspond to the arteries of the cerebrum; the bark of the shoots or branches to the tunics of the arteries; and the fruit or berry to the cortical substance itself, which is the last production of the artery. Thus from the analogous example of plants, we may be allowed the deduction that the cortical substances, or the off-spring fruit of the arteries, do not spring from the vessels direct, but from their tunics. The same may be confirmed also from a comparison of the heart with the cortical substances which are so many simpler and more perfect little hearts, n. 135. For the heart of the body does indeed depend on its vena cava, the ascending and descending; but both these veins swell out and coalesce into one great sinus, called the right auricle; from this auricle, or swollen venous sinus, the heart itself comes forth, like an appendix. From this comparison it follows that the vessel, when it goes off into a cortical gland, likewise begins to swell, and that it draws from the matter of its tunic a substance, which constitutes the very body of the cortical gland, a substance, however, that is more simple and perfect in the cortex than in the heart of the body; and

hence that the tunic, or the matter of the tunic, goes off into the matter of the cortex,—in a manner scarcely unlike to that in which the muscular substance of both vena cava and of the auricle goes off into the body of the heart. Add to this the confirmation arising from the fact that the arterial vessel of the cerebrum is never seen terminated in a cortical gland, but as continuing its way, and, in the meantime, giving rise to many such glands at its sides, like the little branches of a tree give rise to the flowers of fruits. The same thing, moreover, is further confirmed by the rules of the doctrine of order and degrees; for ascent to a superior degree and potency is made, not by ramification, but by vessels of a middle nature, which are already elevated to a higher potency. But I confess, that here we are not able to bring forward ocular experience as a sign of confirmation. For, since the very ramifications of the arteries cannot be followed by the microscope, how then shall the stamens springing from the arterial tunics? Still we may be allowed to await the favorable assent of experience, and in the meantime, it behooves me to formulate reasons from analogy and comparison; which, however, although they persuade us, yet cannot but appear under the garb, of conjecture. But in the meantime, from these as principles, we have drawn a series of consequences, on which, if they entirely agree with all the proofs of experience, I ought certainly to proceed, being sure of the truth of the principles. For if causes are confirmed by all the effects, and this without exception, I know not but that the cause should stand firm and entire, and be the verimost cause to be predicated of the effects. Therefore comes the sequence: *For the cortical glands depend on, and frondesce from, the sides and tunic of their parent arteries, no otherwise than as grapes and berries around the tender fingers and twigs of the tree; and they spring forth and become fruit, not from the woody and medullary portion, but from the cortical portion, or from the inner bark.*

172. *When the cortical glands have been thus germinated, purest stamens of a like nature, drawn from the pia mater, superadd themselves, forming and weaving the most tender meninx of the cortical glands. That the cortical glands are*



girt about with a most delicate meninx, there is no room for doubt; for, in lesser type, they are not only little glands and hearts, but also little brains, see Trans. II., n. 191-196. Add to this, that whatever enjoys any active force must also be furnished with a limit or tunic which shall terminate the forces; otherwise it would not be confined. And that this most delicate meninx, or finest pia mater, which overlays each single corticle gland, is derived by continuity from the common membrane of the cerebrum called the pia mater, we are persuaded both *a priori* and *a posteriori*. *A priori*: Because thus, and in no other way is there a connection of all the particulars with each other mutually, and with the general. *A posteriori*: Because the meninx insinuates itself in the single folds and winding fissures of the cerebrum, and covers each one as it covers the cerebrum itself. This is confirmed by such clear-sighted investigators of the brain as Pacchioni, Willis, Leeuwenhoeck, Ruysch, and others. It is equally confirmed by the nerves also, which are the particular productions and appendices of the medullary portion of the cerebrum and cerebellum; for the nerves, girt about with the same meninx from the inner fold or membrane of the tunic, detach and send down fine stamens which not only bind together the fascicles and the enclosed fibres, but also invest the single fibres. Likewise also by the glands, ganglia, and muscles of the body; for their single parts are girt about with a manifold tunic, and from the interior surface of the membrane nearest attached to them they draw forth stamens, yea, a thread of stamens, which twines about the enclosed parts and reduces them to a common conatus. *For thus the universal enters into and determines every singular, and a common animus rules in the least particulars of the cerebrum; like as in other compounds, as in the glands, ganglia, nerves and muscles of the body, wherein the engirding membrane gives off shoots, which invest the enclosed parts and at the same time connect them.* This rule follows from truly philosophical principles, which dictate that genera enter into species and species into particulars; that is to say, that universals enter into singulars or superiors into inferiors. That the genera and species of com-



pounds are determined by the quality of the parts and by the mode in which those parts are inter-connected, see Wolff in his *ONTOLOGY*, § 539; and for the definition of genus and species, see *ibid.*, § 533-534. That the vessels or fibres of the pia mater are cognate or homogeneous with the vessels or fibres of the tunic of the arteries, will be seen demonstrated in the Transaction on the Pia Mater.\*

173. *These stamens, or vessels emulous of the fibres, rush forth, bundlewise, from the tunic of one artery and inflow into the tunic of another or neighboring artery; and this so compactly that they form a species of membrane wherewith they connect artery with artery and join them together.* Examine merely Fig. 8 [n. 37], where FG, EH, DI, CK and BA designate arteries, while the intervening parallel stamens are the vessels or fibres of which we are now treating.

174. *To these stamens, fibrils detached from the interior layer of the pia mater, seem to add themselves at right angles,† and, with the transverse fibres of the tunics, to weave an entire membranous web.* And this for the same reason as that treated of above, n. 171. Leeuwenhoeck himself also makes mention of transverse fibres, which cannot but flow at right angles from the pia meninx.

175. *In this way, these vessels emulous of the fibre, firmly hold, not only the larger vessels and their offshoots, but also the cortical glands, which depend on the vessels, and the fibres which depend on their glands, in a suitable situation, distance, connection, order, law, form, mutual regard, and determination, and in the stream of the general and particular motion; and this, howsoever the cerebrum is expanded, or constricted, howsoever it bears itself, is in a tumult, is agitated or smitten; that is to say, whatsoever the action of the sense, the animus, and the will.* For the dependence of all is on the vessels, since on these depend the glands, and on the glands the fibres. Wherefore if the vessels are held connected, the rest also are held; by which connection care is taken that the little append-

\*Cf. *THE BRAIN*, n. 419, 419 e, 419 h.—Tr.

†The Latin here is *ad perpen-*

*diculum*, literally "at a perpendicular."—Tr.

ices and extremities may undulate. The vessels, and also the fibres, are said to be held in the stream of motion, when they are held in a situation that is conformed to the expansory motion of the cerebrum; for from this we can judge what is the form of the motion. But of this, where we treat of the arteries.\*

176. *And thus preserve, whole and perpetual, the permeability, circulation, and life of the single parts.* There can be no circulation through the vessels of the cerebrum unless those vessels preserve among themselves such mutual situation, connection, and form arising therefrom, as entirely corresponds to the mode of the cerebral expansion and constriction; which means the same thing as being held in the stream of motion. For the cerebral arteries are not furnished with a muscular tunic, like the arteries of the body, but with a kind of nervous and membranous tunic, which is patient† and yielding, and is obsequious to the force of the animation of the cerebrum, or cortical substances. Therefore, in place of the muscular tunic, which, by its own force, impels the enclosed blood stream into the successive ramifications, cerebral arteries of this kind are furnished with fibres, cords, or potencies; otherwise the blood stream would never run through them. But if we would really comprehend these organs of nature to the uttermost, it is of importance that we know the nature of the difference between vessels of the cerebrum and vessels of the body, and between their modes of carrying on their systoles and diastoles.

177. *Fascicles of such fibres, stretched out between the tunics of the arteries on both sides, emulate the motor fibres of the muscles of the body.* That fibres of this kind, stretched out between the larger cerebral vessels, are not so delicate is

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\*Swedenborg seems here to refer, not to the *ECONOMY OF THE ANIMAL KINGDOM*, which he had already published, and whose second chapter treats of the arteries and veins of the body; but to a future work dealing, in whole or in part, with the arteries of the

brain. These arteries are the subject of Chapter VI. of the work on *THE BRAIN* (n. 355 *seq.*) to which chapter and particularly to n. 386-389, 396-400, the reader is referred.—TR.

†I. e., manifesting a passive quality.—TR.



clear from the description by Leeuwenhoeck, who says : "I saw one fibril that consisted of a number of fibrils ; yea, a fibril furnished with six sides. . . . These fibrils, I suppose, are also clothed with delicate little membranes. . . . I take it that these 'cerebral fibrils are easily four times thicker than the flesh fibrils of the ox" (n. 37-38). For they so correspond to vessels that they are more simple among the smaller vessels than among the larger ; for nature is present everywhere in her lesser modes and in her measures.

178. *And, like binding and combining cords, they not only connect the arteries in respect to their tunics, but also so extrinsically dispose them, that they perform and keep up their systole and diastole in the most obsequious manner, according to the every nod of the cerebrum.* How these cords, emulous of the motor fibres of the body, direct the alternations of the expansion and constriction of the cerebral arteries ; yea, perfect them, is not easy to understand, unless we are thoroughly conversant with the mode in which the cerebral arteries carry on their systoles and diastoles. For, as pointed out above, these arteries are passive, and obsequious to the force of the cerebrum's animation, nor are they furnished with any muscular tunic. On this account, they are opened and constricted by a different force, and in a different way, than the arteries of the body ; and, indeed in such way, that it is necessary that there be intervening cords of this kind to bring aid. They are almost like the cords, called *chordæ Willisianæ*,\* which, stretched within the cavity of the longitudinal sinus from side to side straight across and obliquely, prevent the sinus from being expanded beyond a limit [see above, n. 2] ; for they are collected somewhat broadly from the tunic of the sinus into a little bundle which is covered by the tunic,—exactly as is the case with the cords of which we are treating. Thus they govern, contract, and remit every point of the arterial vessel of the cerebrum. *And, at the same time, they hold their*

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\**Chordæ Willisianæ* or *Wil-* by Swedenborg in his work on *lisii*, so-called from the English THE BRAIN, n. 332, 347, 348.—anatomist who first described TR. them. Their use is fully shown



*alternate expansions and constrictions within stated limits, not unlike the chordæ Willisianæ in the interior of the falciform sinus,\* and moderate, and, as it were, poise them on the beam of a pair of scales; for they react and draw back just so far as the forces of the cerebrum and the blood enclosed in the arteries acts and produces tension. Hence arises action and reaction, and as many restorations of the state as there are changes.*

179. *The fibres thus colligating the cerebral blood vessels also provide that the vascular or fibrous stamens of which the arterial tunics are woven, be never devoid of their due abundance of perfluent humor. For, by means of these fibres, any portion of the fluid found in the tunic of one vessel, or in the stamen of one tunic, is communicated to all the others, where soever they may carry on their action. Thus there is not the smallest hair-like vessel the filament of whose tunic cannot demand from the public what it needs, and call that common property, yea, proper to itself and its very own, which the neighboring and even the more remote vessels possess and carry. This is of the greatest importance to the cortical glands which, originating from these little stamens, draw out and suck from them their essence and purer juices. Like as obtains in the tunics, obtains also in the arterial vessels of the cerebrum, that is, in the single branches and offshoots of the carotid and vertebral arteries, which are so interjoined by perpetual anastomosis that of them may be predicated a perfect communion of goods, that is, of blood. And, indeed, such communion, that whatever the trunk carries, this each branch can claim as its own,—for to it is brought as much as it needs; and whatever the branch carries, each offshoot, yea, each least hair-like thread, asserts to itself as its own property. That such is the nature of the communion and commonwealth of the cerebral arteries will be seen confirmed by many considerations in the Transaction on those arteries.†*

\*Another name for the longitudinal sinus, the coat of which is formed by the duplicature of the falciform process of the dura mater.—TR.

†The reference is, perhaps, to THE BRAIN, n. 355, seq., especially n. 389-392; cf. note to n. 175 above.—TR.

As is the communion of the arteries, such, and indeed more perfect, is the communion of the little canals whereof the tunics consist; for these convey their dew to each single cortical spherule; see above, n. 171.

180. *Moreover these vessels, emulous of the fibres, forming a species of continuous membrane between the tunics of the cerebral arteries, are like uninterrupted paths and little bridges flung across, whereby there is a connection and continuation of the one with the other. Hence it follows that the sensations, modes and degrees of each single organ, as soon as they are immersed in the medullary lake of the cerebrum, spread themselves out to every point of the vessel, meninx, cortex, and fibre; and thus present to the most simple little brains, that is, to the interior sensoria, or the cortical spherules, a representation of the image that has been impressed on the external organ, and by the nerves, has been poured forth into the medullary field of the cerebellum, and this in a type and idea similar to that in which it had been received. That all external sensations, whatsoever they be, and wheresoever laid up, straightway refer themselves to the common sensory or to the cortical substance of the cerebrum. See Trans. I. and II. [n. 191-195, 287]. And therefore, experience adds to reason sufficient proof that these sensations, which are forms of the forces arising from the difference of the purest touches and impulses in the external organs, are elevated by means of continuous nerves and afterwards, when they have left the nerves, by means of continuous medulla, towards beginnings, or towards the extreme ends of the arteries, and this by a path laid down in the fibres.*

181. *Behold, then, the manifold uses of these vessels or stamens! And, therefore, it is to be reckoned among the highest tributes of praise due to the illustrious Leewwenhoeck, that he has given to the learned world a knowledge of these fibrils, as he calls them, discovered by the microscope.*

182. But the question arises, Whence is the tunic of the cerebral blood vessels, wherefrom these vessels, emulous of the fibre, run forth? Whence are the fibres of that tunic? And also, What kind of humor do they carry? Where do they lay



it down? And for what use and effect? But let us take up these points one by one. *Whence is the tunic of the cerebral blood vessels, wherefrom these vessels, emulous of the fibre, run forth. In the arteries of the body there is an inmost tunic,—that tunic, namely, which interiorly colligates and subtends the rings of the muscular tunic, and which is called the membranous, and by some the nervous tunic. This tunic it is which is first drawn around the tender arterial canals and is thus the first to be born; and which, in the capillary offshoots, last remains, and is reborn. The carotid and vertebral arteries, as soon as they touch the first bony threshold of the cerebrum, lay aside their muscular and other tunics, such as the tendinous, glandular and vascular,—all of which are the progenitors and fellow workers of the muscular tunic,—and retain this inmost tunic. As to the tunics of the arteries of the body, see Trans. I., Ch. II. [n. 116-240, particularly n. 136-147]; and as to this inmost colligator of the rings, *ibid.* n. 187, 188, 189.*

**183.** BUT WHENCE ARE THE FIBRES OF THE TUNIC? *Under the epidermis, in the stomach, in both lungs, and elsewhere, are most delicate glandular and organic forms, not unlike those of the cortical glands, which are raised up by propagations from the nerves. From these proceed little canals or ducts, emulating fibres, which are reflected towards the vessels of the body, larger and smaller, and which, as it appears, weave this inmost tunic of the arteries and outmost of the veins. These fibres, resuscitated from this origin, are not the genuine fibres of the cerebrum, but, depending on their gland as on renewed origins, they are the re-formed fibres of the body; and hence they are vessels of a middle nature, or vessels emulous of the fibre, and are the genuine corporeal fibres. Although these fibres are continuations of the fibres of the cerebrum, still the nature of the fibres of the cerebrum is not changed in glands of this kind, raised up in the body, than as the vessels of the cerebrum are changed when transformed, by means of the cortex, into fibres. For the whole fibre or fibrous duct that leads or springs forth from this gland, puts on its nature from the prefixed gland and its modes of action, and also from its perfluent fluid. These fibres, therefore, deserve to be called the renewed fibres*



of the body, or simply corporeal fibres. It would be a long task to follow up the birth of these fibres with the confirmation of experience, nor is this the place. In the meantime, it is a matter of common knowledge that extremely minute glands of this nature are gathered together in the extremes of the body, and elsewhere, in such abundance as to form an entire membrane; and that they exhale and absorb an immense abundance of effluvia, which they transmit into the blood; and, therefore, they seem to be reflected towards the blood vessels.

184. WHAT KIND OF HUMOR DO THEY CARRY? *These military and highly subtle glands, furnished as they are with little mouths, imbibe from the circumfluent atmospheres, and from the inmost essence of the food that is taken in, effluvial exhalations, and the primitive elements of salts; and by their emissary ducts, emulous of fibres, they transfer these, by way of the arteries, to the substances of the cortex; and, in fact, as actual experience seems willing to confirm, convey alternately the most chastened lymphs impregnated with saline elements, and the juices and spirits proper and native to the animal kingdom.* Scarce otherwise than as is the case with the lymphatic vessels or thoracic ducts, which freight towards the subclavian vein sometimes pure lymph, and sometimes chyle. That such subcutaneous, ventricular, and pulmonary glands in great abundance open wide their little mouths and breathe in effluvial exhalations, is sufficiently obvious from the Sanctorian perspiration; and also from our changes, in the daytime and in the night, according to the states of the atmospheres by which we are surrounded. Contagious diseases and many other phenomena also give confirmation to the same effect. I think it established beyond any possibility of doubt, that vessels of this nature yawn open in the extremes and inmosts of the viscera, and eagerly snatch up the purer essences, and, having snatched them, immediately bear them off, either into the blood, or into the cerebrum.

185. WHERE DO THEY LAY THIS HUMOR DOWN? *Beside the abundance which they pour into the veins, they carry the purest part up to the cortical glands of the cerebrum, cerebellum and their two medullas, which are raised up and form-*

ed from these little vessels, ducts, and stamens at the side of the arteries. Wherefore, by the mediation of these vessels, emulous of fibres, the outmost parts of the body communicate with the inmost parts of the brain; and thus the most select and highly purged elementary and animal humor is laid down in the beds and little sinuses of the cortical substances, and is thence derived into the appended fibres. This follows as a consequence or from the connection of causes with the things caused. For if the above mentioned elementary glands imbibe, with their open mouths, juices from the circumfluent atmosphere; and if their ductules lead and reach up to the cortical substances by way of the arteries or their tunics; and if it is they that bring the cortical glands into existence; it follows that they carry thither the imbibed essences which cannot but be most highly purged, that is to say, that they deposit them only in the ultimate terms of the vessels or the first terms of the fibres, in other words, in the cortical glands. Experience in respect to innumerable effects proves the same thing. Hence also must be sought the causes of many diseases, such as hysteria, and other [mental] diseases, and certain kinds of melancholia, which from these causes, penetrate into the cerebrum and its imagination, yea, into the reasonings of the mind itself.

186. Finally the question is asked: FOR WHAT USE AND EFFECT? *Namely, in order that they may serve to the cortical glands, as to so many most highly simple and perfect laboratories, the essences and quintessences of purer nature, upon which these glands may pour their own vital essence; from the commingling of which two essences the animal spirit is conceived, prepared and given forth, and is thence sent out into the fibres continued from the glands. For this end, the cerebrum looks around for help from its whole circumfluent world, and ingeniously prepares approaches, passages and exits in order that from the mingling of elementary parts with parts that are truly animal, spirits may be prepared that participate of both and possess in themselves the animal and spirituous nature of the body consociated with the elementary nature of the world. But on these matters we shall treat more fully in*



the Chapter on the Animal Spirit.\* The common opinion holds good, that the animal spirit is elaborated from the purest elements of the vegetable and mineral kingdoms, and also of the atmospheric world; and, moreover, that the spirit thus elaborated is not purely elementary but is also animal, and is therefore called spirit; also that this spirit flows down from the cortex into the fibres. How these things follow on to the effect, is now, I think, to be explained. It remains only to treat in detail of the matters which have here been spoken of in general; for each detail can be confirmed by abundant experience.

187. *Behold, then, the most excellent and manifold use resulting from a theoretical examination of these vessels; a use which comprehends the arcana of the animal kingdom and also the manner of its work. But still there can be no satisfactory knowledge and confirmation in respect to what we have put forth, unless we have some general experience; and a particular anatomical experience in respect to the details; unless also the physical facts of the phenomena be investigated even to their causes.* Confer. Trans. I., n. 1-117.

(To be continued.)

### NOTICE.

The fourteenth annual meeting of the Swedenborg Scientific Association will be held in Philadelphia, on Monday, May 22, 1911, at Odd Fellows' Temple, Room C, Floor 5, Cor. Broad and Arch Streets.

9:30 A. M. Meeting of Board of Directors.

10:00 A. M. First Session of Association.

12:00 M. President's Address—Swedenborg on Life in Other Planets.

2:30 P. M. Election of Officers followed by papers and discussion.

Persons wishing to present papers or other communications will kindly communicate with the undersigned.

REGINALD W. BROWN, *Secretary.*

\*This chapter is not included in the manuscript of which the present work is a translation. But elsewhere in the author's manuscripts there is a short treat-

ise on the Animal Spirit, which has been published in *OPUSCULA PHILOSOPHICA*, and translated as one of a series entitled *POSTHUMOUS TRACTS.*—Tr.



# THE NEW PHILOSOPHY.

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JULY, 1911.

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No. 3.

## Editorial Notes

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We note with regret the decrease in the membership of the SWEDENBORG SCIENTIFIC ASSOCIATION, as reported by the treasurer on another page of this issue. This decrease more than offsets the satisfactory increase reported last year. We call attention to this matter to bring it prominently to the minds of our readers; but we make no comment, other than to express the hope that next year may witness a more extended support of the important work performed by the Scientific Association.

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It may be of interest to our readers to learn that Swedenborg's little treatise on THE FLYING MACHINE, which was published in pamphlet form by the SWEDENBORG SCIENTIFIC ASSOCIATION, in May, 1910, was reprinted in the July number of our English contemporary, the AERONAUTICAL JOURNAL.

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We learn that the third volume of the Royal Swedish Scientific works has now been published. All subscribers to the work who have changed their addresses, should communicate their new address to the Secretary of the Association, Reginald W. Brown, Bryn Athyn, Pa.

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Attention is called to the advertisement in this issue announcing the publication of THE SENSES. During the summer will be published the remaining parts of this work, the trans-

lation of which is completed in our present issue. We hope, however, in the October NEW PHILOSOPHY to print a first instalment of Swedenborg's draft of chapters on Touch and Taste. The finished chapters were published by the author himself as Part III. of the ANIMAL KINGDOM, but the first draft includes a number of interesting points not incorporated in the printed work. The inclusion of these chapters in the work on THE SENSES, will make that work complete as a first draft of Swedenborg's treatise on the Five Senses.

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#### THE WORK ON GENERATION.

The revision of this work is now practically completed, and will shortly be put in the hands of the printer. It is confidently expected that the book will be published on or before October 1, 1911. All paid subscribers will receive copies immediately on publication.

The number of subscriptions is as follows:

Previously reported .....	145	Wethey, L. E., Cambridge, Mass.	1
Schwenk, Th., Meridien, Conn.	1		
			Total Subscriptions .....
			147

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#### A NEW BIOGRAPHY OF DR. WILKINSON.

JAMES JOHN GARTH WILKINSON. A memoir. By Clement John Wilkinson. London. Kegan, Paul, Trench & Co. 1911. pp., 303. Price, 10 shillings.

The name of Dr. Wilkinson will always be revered by students of Swedenborg's Scientific writings; indeed, it is to Dr. Wilkinson that the English student owes most of his knowledge of these writings. Head and front of the Swedenborg Association in the 40's, it was this literary and scientific genius who was among the first to call practical attention to these earlier works of Swedenborg; and it is to his untiring pen that we owe the first and only English translations of such important works as THE ANIMAL KINGDOM, THE GENERATIVE ORGANS, THE POSTHUMOUS TRACTS, THE ECONOMY OF THE ANIMAL KINGDOM, and THE INFINITE, to say nothing of the

Latin works, *DE FIBRA*, and *OPERA POSTHUMA*, published under his editorship.

The life of such a man will always be of interest, and we welcome this new biography written by his nephew. We say "new" biography, because this is the second work of its kind, the former being a biography written by Professor C. T. Odhner. The author of the present work, however, seems to be unaware of the existence of Mr. Odhner's book, as throughout his three hundred pages he makes no mention of it. There is a marked distinction between the two works, especially in the feature of the many original documents that characterizes the present biography.

The work is divided into four chapters: Biography; The Swedenborgian; Homœopathy, etc.; Appreciations. Of these chapters the last "is devoted to estimations of Garth Wilkinson's character and work from divers pens," and it is here especially we notice the absence of the high tribute paid to Dr. Wilkinson's work and genius by his first biographer.

We do not propose to enter into any detailed review of this book. Its writer seems to have been inspired by the desire to give facts, rather than by any intimate and sympathetic entry into the aims and ends of Dr. Wilkinson's life-long work as a Swedenborgian. But even with this defect his book is of exceeding value and interest to all who would understand and enter sympathetically into the work of its subject; for with its abundant citations from diaries and personal letters, it supplies what, after all, is a large, and, perhaps, the most important posthumous basis for any true estimation of the character of a public man.

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"DE SALE COMMUNI."

DE SALE COMMUNI. Emanuelis Swedenborg, opus posthumum. Nunc primum edidit Alfred Acton. Philadelphia, Swedenborg Scientific Association. 1910. Pp. 166.

This work, taken from among Swedenborg's as yet unedited manuscripts, was published last October under the editorship of the Rev. Alfred Acton, in whose hands its produc-



tion had been placed by the Swedenborg Scientific Association. Besides the Latin text, which consists of sixty chapters distributed over 153 pages, the editor has given us an introduction in Latin of four pages, and a brief but useful index of authors and works mentioned in the text. The critical notes and the corrections given as the result of a comparison with the original manuscript shows the care taken in the preparation of the work for the press.

The editor in his preface describes as follows the circumstances leading to the publication of this work: In 1901 Mr. C. H. Asplundh having called attention to the existence of more than 2,500 pages of unedited manuscripts, he and the editor and the president of the Swedenborg Scientific Association were chosen as a committee to provide for their transcription and editing.

The work of transcribing these manuscripts, begun under the direction of the Rev. J. E. Boyesen in 1902, was shortly afterwards taken up by Mr. A. H. Stroh, who in a short time brought it to completion, submitting the following treatises, of which the fifth is the *DE SALE COMMUNI* just published:

- Codex 36, Excerpts from Aristotle, Plato, etc.
- Codex 37, Index of various philosophical terms.
- Codex 81, On the Magnet.
- Codex 82, On Sulphur and Pyrites.
- Codex 83, On Common Salt.
- Codex 84, On the Secretion of Silver and Copper.
- Codex 85, On Vitriol.
- Codex 86, Things Geometrical and Algebraic.
- Codex 88, Various Philosophical and Anatomical Matters, and Journeys.

Codex 99, Description of Swedish furnaces in which iron is treated. (Written in Swedish.)

The work on Common Salt having been the first to be transcribed, it was the first to be published. The cost of its publication in an edition of 500 copies, was borne by THE ACADEMY OF THE NEW CHURCH, THE GENERAL CONVENTION OF THE NEW JERUSALEM, and THE ROTCH TRUSTEES.

A committee was appointed this year to examine the remain-

ing transcriptions. The Rev. A. Acton, examining the one from Codex 84, reported that it was unmistakably a first draft of the work on Copper.

The editor assigns the date 1728 as the earliest in which the *De Sale Communi* could have been completed, thereby differing from Dr. R. L. Tafel, who assigned it to 1722. The date 1728 is based upon the statement (page 41) about an Ekhart, "who died in the year 1728." The editor shows, however, that parts of the work were begun as early as 1724. He considers it should be regarded as a continuation of the series of works contemplated in the publication of the "Iron" and "Copper."

With regard to the work itself, it is a compilation of various modes in vogue for extracting salt from the sea, salt wells, mines, etc, and for preparing chemical substances allied to salt. The subject of the text is almost entirely excerpts from various authors illustrated by their wood cuts when referred to in the text.

It would be an interesting study to institute a comparison of *DE SALE COMMUNI* with the chapter in the *CHEMISTRY* of that title in which the geometric shape of the salt particle is considered. The comparison would probably have to be with the experimental data of the latter, since the *DE SALE COMMUNI* is without any theoretical feature.

E. E. I.

TRANSACTIONS  
OF THE  
FOURTEENTH ANNUAL MEETING  
OF THE  
SWEDENBORG SCIENTIFIC ASSOCIATION.

The Fourteenth Annual Meeting of the Swedenborg Scientific Association was held in the Haymarket Building (Odd Fellows' Temple) in the City of Philadelphia, on Monday, May 22, 1911.

1. The meeting was called to order by President Sewall at 3 P. M., the hour of meeting first announced having been changed.

2. The minutes of the Thirteenth Annual Meeting as printed in the *New Philosophy* for July, 1910, were approved.

3. The Chair appointed the Rev. E. E. Iungerich a Committee on the Roll. The committee reported the following members and visitors in attendance:

*Members:* Rev. A. Acton, Rev. W. H. Alden, Rev. R. W. Brown, Rev. C. E. Doering, Mrs. C. S. Glenn, Mr. L. E. Gyllenhaal, Rev. E. E. Iungerich, Mr. K. Knudsen, Mr. R. Pitcairn, Rev. E. S. Price, Rev. Frank Sewall, Rev. H. Synnestvedt.

*Visitors:* Mrs. A. Acton, Miss C. Bellinger, Mr. W. C. Davis, Rev. C. W. Harvey, Mrs. C. W. Harvey, Miss F. H. Hemperley, Mr. W. Howard, Miss H. Iungerich, Miss S. Iungerich, Mr. V. Johnson, Mrs. K. Knudsen, Miss C. E. Mason, Mrs. P. MacIntyre, Miss F. McQuigg, Miss E. Mitchell, Mr. H. L. Odhner, Mrs. J. Smith, Miss M. Smith, Mrs. R. Walker, Mrs. H. Synnestvedt, Mr. R. Wells.

4. In the absence of the Treasurer his annual financial statement was presented by the Secretary.

5. The Chair appointed the Revs. C. E. Doering and W. H. Alden a committee to audit the Treasurer's accounts.



6. The Board of Directors reported having had three meetings during the year. The first on May 16, 1910, for the election of officers. The second on October 17, 1910; at this meeting the following actions were taken: (a) It was agreed to contribute the sum of £10 toward the support of Mr. Alfred H. Stroh, in Sweden, this sum having been tentatively offered by the Rev. Alfred Acton as the representative of the Scientific Association at a meeting held under the auspices of the London Swedenborg Society in London on July 11, 1910; (b) it was agreed that a copy of *De Sale* bound in fitting style should be sent as a memorial to be presented at the Bicentenary Celebration of the Royal Society of Sciences of Upsala, and that Mr. Stroh be appointed our representative to present the same; (c) it was also agreed that a memorial address written in Latin by Dr. Sewall to be presented at the Upsala Celebration should be suitably inscribed at the expense of the Association. The third meeting of the board was held on May 22, 1910, and it was suggested at this meeting that the Association take further action in regard to continuing for the coming year the contribution of £10 toward the support of Mr. Stroh.

7. The Editor of the NEW PHILOSOPHY reported that the printing of the translation of the work on the SENSES, which has been continued for now almost eleven years, is very near completion, only about fourteen pages remaining to be published; and that in accordance with the resolution of last year's meeting (Minute 22) the work will be followed by a translation of the chapters on *Touch* and *Taste* copied from the photolithographed MS. by the Rev. E. E. Iungerich. The Editor also reported that a little more than one-fourth of the work on the *Fibre* has been printed, and that a third sixteen-page fascicle of this work and five more of the work on the *Senses* have been reprinted.

8. The Editor of DE SALE reported the completion and publication of this work which appeared last October in an edition of 500 copies. The work makes a volume of IX+167 pages, comprising, besides the work proper, an Introduction by the Editor, and thirteen pages containing a list of authors quoted, and critical notes, etc. The Treasurer of the Associa-

tion has in hand the binding of a number of copies for presentation to various public libraries, and for sending to the journals for review. The report reminded the Association that it has in its possession about 2,000 manuscript pages of transcriptions of Swedenborg's Scientific MSS., and suggested that the Association appoint a committee to report on the contents of these MSS. with a view to choosing one for publication.

9. The Translator of *DE SENSIBUS* reported the completion of the translation of the published portion of this work, and that he hoped to be able to make a beginning of the translation of the unpublished chapters transcribed by the Rev. Eldred E. Jungerich.

10. The Rev. Alfred Acton made a verbal report as representative of the Swedenborg Scientific Association to the Swedenborg Congress held in London, England, last July. He spoke of the success of the meeting, but forbore from entering into any details since numerous and full reports had already been printed.

11. The President, as one of the representatives of the Association, at a meeting held in London in July last in the rooms of the Swedenborg Society, at the close of the International Swedenborg Congress, reported that the various bodies hitherto contributing to the support of the work in Sweden carried on by Mr. Alfred H. Stroh in phototyping, transcribing, translating and publishing the MSS. of Swedenborg—namely, the Academy of the New Church, the General Convention of the New Jerusalem, the Swedenborg Society of London, the American Swedenborg Society, and the Swedenborg Scientific Association—came through their authorized delegates to an agreement under which the central and general agency of this work, which had hitherto been assumed by the Swedenborg Scientific Association, was now transferred to the Swedenborg Society of London, to whose treasurer all contributions for the work should henceforth be sent in the allotted portions as agreed upon at this meeting. In the same way the reports of Mr. Stroh are to be sent directly to the contributing bodies instead of being addressed as hitherto



through our Association. It was proposed to raise in all the sum of \$4,000.00, annually for five years, and to pay to Mr. Stroh an annual salary of \$1,800.00.

The Rev. Alfred Acton, the second representative of the Association at the above meeting, reported that it had been decided at this meeting to undertake the phototyping of all the theological MSS. of Swedenborg not hitherto reproduced, the work to commence with the *Adversaria*, over 200 pages of which have already been phototyped. Mr. Acton further reported that it had been decided to increase the compensation of Mr. A. H. Stroh, his salary to be furnished by various bodies, but to be paid by the treasurer of the Swedenborg Society, this body undertaking also to supervise the work. On behalf of the Association and as its representative Mr. Acton had offered to contribute \$50.00 to Mr. Stroh's salary subject to the approval of the Board. A proposition had been made in the meeting that the opinion be formerly registered that all prefaces to Swedenborg's works be confined to subject-matter of an historical or bibliographical nature. The proposition, however, did not meet with favor and was not adopted. It had been agreed at the meeting that the bodies represented should each inform the other of any translations or other editions of Swedenborg which it decides to publish, the object of the agreement being to avoid duplication of work.

12. President Sewall in his annual report spoke of the progress of the work now being so efficiently done by the Royal Swedish Academy of Sciences, and of the completion of Vol. III. of its edition of Swedenborg's Scientific Works under the title of *Miscellanea de Rebus Naturalibus*, thus completing the set of three volumes for which the Association secured subscriptions in this country. Dr. Sewall also spoke of the faithful and untiring work of Mr. Alfred H. Stroh, who has not only conducted his research and editing work with unceasing zeal and fidelity, but has also been largely instrumental in bringing about the recent notable honors to Swedenborg rendered by the King and Parliament of Sweden and by the Church, the University and the Royal Academy of Sciences. "Graduating, as it were, from our Association's



agency to a service of much wider and more illustrious recognition, Mr. Stroh, on the 31st of March last, in the presence of the Royal Academy's Committee in Stockholm, received at the hand of King Gustav, of Sweden, the Academy's Swedenborg medal struck for the first time in gold." "With these events (said Dr. Sewall) our Association seems to have reached a pivotal year in its existence, its task of procuring the preservation and publication of the scientific works being shifted to so large and trustworthy a body as the Royal Swedish Academy of Sciences, and the responsibility for the maintainance of the editorial work to that distinguished central publishing body of notable record, the Swedenborg Society of London, which now enters upon a new century of its existence." Dr. Sewall also reported that during the past year our Association was represented on the occasion of the solemn unveiling of the Swedenborg sarcophagus in the Upsala Cathedral in November last by Mr. Stroh, for which occasion also our president dedicated a copy of his recent work, entitled SWEDENBORG AND THE SAPIENTIA ANGELICA, published in London in Constable's Series of *Philosophies Ancient and Modern*.

13. On motion it was agreed that the Board of Directors be authorized to contribute the sum of £10 towards Mr. Stroh's support for the coming year, provided the funds of the Association permit.

14. The Secretary was instructed to make an announcement in the periodical of the Association inquiring whether there have been any changes of addresses of subscribers to the third volume of the Royal Swedish Academy's edition of Swedenborg's scientific works.

15. On motion it was agreed to send the copy of DE SALE, which had been prepared as a memorial to be presented at the bicentenary celebration of the University of Upsala, and which had not been sent on account of a misunderstanding as to the nature of the celebration. According to the motion the memorial gift was to be accompanied by a suitable explanation as to why it had not been sent before.

16. On motion it was resolved that the Board of Directors be authorized to put a price upon and distribute the work DE SALE.

17. Dr. Sewall raised the question as to whether the Association should undertake any further publications of this type in view of the work that is being done in Sweden. The question was left open.

18. On motion it was resolved that a Committee of three consisting of Messrs. Acton, Brown and Iungerich be appointed to investigate the transcripts of Swedenborg's scientific MSS. in possession of the Association, and to report as to the advisability of selecting one or more for publication.

19. On motion the following resolution was unanimously adopted:

"WHEREAS, Mr. Alfred H. Stroh went to Sweden in 1902 as the agent of this Association in investigating, deciphering and publishing the MSS. of Swedenborg's Scientific Works; and,

"WHEREAS, In his diligent pursuit of this work he has won the esteem and gained the co-operation of the Royal Swedish Academy of Sciences to the extent of securing the prospect of the publication by that body of a complete edition of the Scientific, Philosophical and Miscellaneous works of Swedenborg, and has been instrumental in bringing about the recent illustrious testimonials from the Swedish Government, and University, and Academy in honor of Emanuel Swedenborg; and,

"WHEREAS, On the thirty-first day of March at the Annual Meeting of the Royal Swedish Academy of Sciences in Stockholm, Mr. Stroh received at the hands of His Majesty, King Gustav, the Academy's Swedenborg medal in gold in recognition of these valuable services rendered by Mr. Stroh during the nine years in which he has labored under the auspices and in the interests of our Association; therefore, be it

"*Resolved*, That this Association unites in cordial and grateful congratulation to Alfred Henry Stroh on his accomplishment of a work whose usefulness and value to the world of learning and to the Church of the New Jerusalem will increase with the passing years, and on his receiving testimonials of high honor and appreciation from the King of Sweden and the Royal Academy under whose auspices he has achieved these memorable labors; and further be it

"*Resolved*, That a copy of these resolutions be sent to His



Majesty King Gustav, to the Royal Swedish Academy of Sciences and to Mr. Stroh."

20. The following officers were elected for the coming year:

*President:* Rev. Frank Sewall, A. M., D. D.

*Directors:* Dr. F. A. Boericke, Mr. Horace P. Chandler, Rev. Chas. E. Doering, Rev. Alfred Acton, Rev. Reginald W. Brown, and Dr. Geo. Earle Cooke.

21. On account of lack of sufficient information for immediate action a motion was adopted that the Auditors make their report to the Board of Directors.

22. The Secretary read a report from Mr. Stroh on the plans for the work in Sweden and on its progress. Mr. Stroh stated that "the work in Sweden has again returned to its usual course after the extraordinary proceedings of the last few years," and that "the editor of the scientific series hopes to finish without further delay the translations of various scientific works undertaken for the Swedenborg Scientific Association, for the Rotch Trustees and for the Swedenborg Society, some progress with these translations having been made during the past year." According to the provisional plans of the Stockholm Committee, determined upon on May 31st, 1910, and April 1st, 1911, Mr. Stroh informs us that the following volumes are included in the series:

Vol. 1. GEOLOGICA ET EPISTOLÆ with an Appendix.  
Published in 1907 with an Introduction by  
Professor A. G. Nathorst.

Vol. 2. COSMOLOGICA. Published in 1908 with an Introduction by Professor S. Arrhenius.

Vol. 3. MISCELLANEA DE REBUS NATURALIBUS. Published in 1911 with an Introduction by the editor.

Vol. 4. DAEDALUS HYPERBOREUS ET VARIA EX ANNIS, 1716-1722. With Introduction by Professor Nils Duner.

Vol. 5. VARIA PHYSICA ET PSYCHOLOGICA. With Introduction by the editor.

Vol. 6. PRINCIPIA RERUM NATURALIUM. With Introduction by Professor Peter Klason.



- Vol. 7. DE FERRO.
- Vol. 8. DE CUPRO.
- Vol. 9. OECONOMIA REGNI ANIMALIS.
- Vol. 10. DE CEREBRO.
- Vol. 11. DE MORBIS CEREBRI.
- Vol. 12. REGNUM ANIMALE CUM INDICIBUS ET NOTIS.

HISTORICIS CRITICISQUE TOTIUS SERIEI.

"Vols. 4 and 5 have been authorized by the Committee and they are about one-half printed or set up. It now seems probable that since such excellent results have been attained with the photolithographic reproduction of the DAEDALUS in Vol. 4, the same method will be employed in reproducing the OPERA PHILOSOPHICA ET MINERALIA in Vols. 6 to 8. Introductions for the Anatomical works will probably be furnished, among others, by Professors O. M. Ramström and S. E. Henschen."

In regard to the investigation of Swedenborgiana Mr. Stroh says: "No better way of taking a general survey of progress made in the investigation of Swedenborgiana can be found than by examining the series of twelve festival publications issued in 1910 in celebration of the Swedenborg Society's Centenary and of the unveiling of Swedenborg's sarcophagus at Upsala." These publications are as follows:

1. OPERA POETICA EMANUELIS SWEDENBORGII. Published by the University of Upsala.
2. FESTIVUS APPLAUSUS IN CAROLI XII. ADVENTUM IN POMERANIAM SUAM.
3. SWEDENBORGIANA. Three new MSS. by Swedenborg phototyped by the New Church Publishing Society of Stockholm.
4. AN ABRIDGED CHRONOLOGICAL LIST OF THE WORKS OF EMANUEL SWEDENBORG. Published by the Royal Swedish Academy of Sciences in English and Swedish editions.
5. KUNGLIGA VETENSKAPS SOCIETETENS I UPSALA TVAHUNDRAÅRS MINNE. By Professor Nils Dunér, including the early minutes and statutes of the

Upsala Society and the facsimile reproduction of the *Daedalus Hyperboreus*. Published by the Royal Society of Sciences of Upsala.

6. THE MORTAL REMAINS OF EMANUEL SWEDENBORG. An account by J. Vilh. Hultkrantz. Published in *Nova Acta Regiae Societatis Scientiarum Upsaliensis*, Ser. IV., Vol. 2, n. 9, by the Royal Society of Sciences of Upsala.
7. TILL KUNGL. VETENSKAPS SOCIETETEN I UPSALA VID DESS 200-ARS JUBILEUM. Published by the Upsala University. After the Preface by Rector Magnificus Schuck follows a work by Professor O. M. Ramström on Emanuel Swedenborg's investigations in Natural Science, especially his statements concerning the functions of the Brain.
8. CONSTITUTIONES NATIONIS DALEKARLO-VESTMANNICAE MDCC DATAE. Published by the Vestmanland-Dala Nation of Upsala University and including notes on Swedenborg's student days at Upsala, 1699-1709.
9. EMANUELIS SWEDENBORGII ITINERARIA RESEBESKRIFNINGAR AF EMANUEL SWEDENBORG UNDER AREN, 1710-1739. Published by the Royal Swedish Academy of Sciences, Stockholm.
10. SELECTAE SENTENTIAE. Disputatio Emanuelis Swedenborgii. A phototype edition published by the New Church Publishing Society of Stockholm.
11. CARMENA BOREA. Opusculum juvenile Emanuelis Swedenborgii. Phototype edition published by the Swedenborg Society of London.
12. EN SWEDENBORG'S REFORMATION. By Hr. Hjalmar Kylén, Stockholm, describing early New Church and "Swedenborgian" movements in Sweden.

"The first four of the above mentioned festival publications were issued in celebration of the Swedenborg Society's Centenary and were laid upon the table of the International Swedenborg Congress, London, on July 5th, 1910. The remaining eight publications were issued on November 19th,

in celebration of the unveiling of Swedenborg's sarcophagus in Upsala Cathedral, and of the bi-centenary of the Royal Society of Sciences of Upsala."

23. President Sewall delivered the Annual Address on "Life in Other Planets." (See p. 83.)

24. The Rev. Eldred E. Iungerich gave an address on "The Two Constituents of Swedenborg's Salt Particle." The following is a summary of Mr. Iungerich's remarks:

The cubical interstice among six water particles is the mold for the alkali; the tetrahedral interstice among four central particles is the mold for the acid. Compared volume to volume, the cubical interstice contains 5.064 times as much space as the tetrahedral interstice. Yet Swedenborg in the CHEMISTRY declares that, bulk to bulk, the alkali is double that of the acid, both being composed of the same matter. No demonstration of this ratio is given, but it is reasserted emphatically several times, and on it depends the subsequent calculation of the specific gravity of lead which results in the known experimental value. If the 2 to 1 ratio is rejected, practically everything in the CHEMISTRY must be put aside, beyond the most general postulate that mineral shapes may be derived from the two sorts of interstices. On the other hand, the ratio of the volumes of the two sorts of interstices can be no other than 5.064 to 1.

The following theory seems to square these ratios: The alkali though molded in the cubical interstice is less in bulk than its mold. The cubical interstice in shape is a cube with its six faces made concave; and its eight vertices bevelled and terminating in flat triangles. *The alkali has eight deep sockets at each of the places where its mold shows flat triangles.* The tetrahedral interstice is a tetrahedron, having four concave faces, and four flat triangles in place of vertices. The flat triangles are equal in size to those of the cubical interstice. *The acid has four projecting spicules where its mold shows flat triangles, these spicules being in the shape of truncated pyramids topped by a hemisphere, and of such size as to fit exactly into the sockets of the alkali.*

The arguments advanced to favor this theory are the following:



1. One alkali unites at its vertices with eight acids to form a salt particle. There could be no union unless there was a ball and socket contact.

2. The balls or spicules are on the acid, for it is declared to consist of "four hollow sides and four extremities or pointed portions." (*Chemistry*, Part XII, § 1, Sect. 2.) The term "pointed portions" cannot properly be applied to flat triangles.

3. The sockets are in the alkali. It is called (Part XII, § 4, Sect. 1) a "cube that has been denuded of its points."

4. The CHEMISTRY declares there is a ball and socket contact enabling alkalies to link on to the acids when they meet. (Part XII, § 1. Sect. 7.)

5. It is stated that the dissolving power of an acid in water is due to the penetrative force of one of the "pointed portions," when there is a pressure from behind by a water particle upon the concave face on the opposite side. *An acid would have no penetrative power if it had no projecting spicules, but in their place flat triangles.* "The acid particle forms an excavated regular triangle, and is wedge shaped, and on this account may be driven into pores with the same ease and power that a wedge is driven mechanically into a cleft." (Part XII.)

6. It can be demonstrated mathematically, that it is mechanically possible for the alkali to contain as deep sockets and the acid as tall spicules as would be needed to make their ratio as of 2 to 1.

The speaker then gave reasons why allowance need not be made to account for the breaking off of ramental particles, and to allow for rough, corrugated surfaces. In conclusion, he stated that the CHEMISTRY, where it speaks of ball and socket contact between acid and alkali, speaks as if these were insignificantly small; and that though on this point it departs from its literal statements, he considered this more in the nature of a trifling emendation whose value is to unite the entire work. This emendation on a point that in many respects is barely developed, enables the 2 to 1 ratio to be accepted.. Without it the 2 to 1 ratio must be rejected, and with

its rejection the entire book on CHEMISTRY falls to the ground.

25. Time permitted but a short discussion of these papers, and the meeting adjourned at 6 P. M.

REGINALD W. BROWN,  
*Secretary.*

### MEETING OF BOARD OF DIRECTORS.

At a meeting of the Board of Directors held immediately after the adjournment of the Association the following officers were elected for the year: *Vice-President*, Dr. F. A. Boericke, 1011 Arch St., Philadelphia; *Secretary*, Reginald W. Brown, Bryn Athyn, Pa.; *Treasurer*, E. F. Stroh, Bryn Athyn, Pa.; Editor of *The New Philosophy*, Rev. Alfred Acton, Bryn Athyn, Pa.

### FINANCIAL STATEMENT.

May 1, 1911.

#### RECEIPTS.

Balance as per previous report.....		\$420 00
Membership dues .....	\$166 13	
<i>New Philosophy</i> subscriptions .....	118 30	
Royal Academy edition subscriptions.....	6 00	290 43
		<hr/>
		\$710 43

#### EXPENDITURES.

Printing <i>New Philosophy</i> , April, 1910, to April, 1911 .....	\$195 98	
Reprints from <i>New Philosophy</i> .....	22 20	
Paper .....	17 00	
Printing "Flying Machine" .....	6 75	
" " "De Sale" .....	106 60	
Cover paper .....	9 00	
Draft to Swedenborg Society, as a contri- bution in support of the work of Mr. Alfred H. Stroh, £10 .....	48 80	
Rent of hall for annual meeting, 1910 .....	9 75	
General expenses, as per cash book .....	42 57	
		<hr/>
		458 65
Balance on hand .....		<hr/>
		\$251 78

The above balance of \$251.78 includes balances carried on the following special accounts:

Swedenborg MSS. ....	\$4 31	
Royal Academy publications .....	10 00	
Royal Academy publications, plates .....	2 00	
Worship and Love of God .....	11 60	
	<hr/>	\$27 91
	E. F. STROH,	
	<i>Treasurer.</i>	

Audited and found correct, May 22, 1911.

C. E. DOERING,  
WM. H. ALDEN,  
*Auditors.*

#### SUBSCRIBERS TO "NEW PHILOSOPHY."

Total subscribers reported May, 1910 .....	237	
New subscribers during the year .....	15	
	<hr/>	252
Subscriptions discontinued:		
By request .....	18	
Dropped for arrears .....	12	
Deceased .....	3	
	<hr/>	33
		<hr/>
Present subscribers .....	219	
Net loss .....	20	

#### MEMBERSHIP STATISTICS.

Total membership report May, 1910 .....	198	
New members .....	4	
	<hr/>	202
Members resigned .....	9	
Members dropped, as per By-Laws .....	12	
Members deceased .....	3	
	<hr/>	24
		<hr/>
Present net membership .....	178	
Net loss .....	20	



## ROLL OF NEW MEMBERS.

Mr. Gerald S. Glenn, Bryn Athyn, Pa.

Mr. Andrew G. Campbell, 181 Stratford Rd., Brooklyn, N. Y.

Dr. A. E. Austin, Madison Ave. and 58th St., New York City.

Mr. Geo. W. Worcester, 709 S. Main St., Rocky Ford, Colo.

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SWEDENBORG ON LIFE IN OTHER PLANETS THAN  
OUR OWN.

BY FRANK SEWALL, A. M., D. D.

The progress of instruction, or, what is called scientific knowledge, is from the known to the unknown; understanding here by the "known" that which is known by the senses or communicated to the mind from without. To these sensations, in order that they may become *knowledges*, there is added something of judgment and reason from the mind within, and so these two factors are involved in every advancement in human intelligence, viz., experience and reason.

It is experience by sensation that enables us to see that the sun is risen, and that the sky is full of stars, some brighter than others, but all very much alike in apparent size and seemingly set in the same concave surface of the heavens. It is reason and calculation that enables us to know that the sun has not risen, but that we have dipped down in our point of vision, and that the stars in the heavens are immense suns with their own revolving planets, and some so vastly larger than others and removed from others by such millions of miles as to make the figures expressing their size and distance quite beyond our power to conceive.

In the progress of the science of astronomy reason and calculation have had so vast a part over the bare display revealed to the eye that it seems almost more a grand mental creation than anything handled by our five senses. Indeed, one of our greatest triumphs in all the history of known learning

was the discovery of the planet *Neptune* merely by the force of calculation; that is, by the conclusion drawn by the observers of certain disturbances of the orbit of the planet *Uranus*, that there must be some powerful attracting body near by, and that that body must be in a certain position fixable by mathematical calculation, even though the body should be invisible. The calculations being made and the search undertaken, the planet *Neptune* was found, indeed, just where and fulfilling just what functions the purely actual processes of the mind had pointed out.

One of the great, and, perhaps, the most fascinating of mysteries remaining for science to solve, or, at least, to aim at solving, is that as to the existence of life, and especially of intelligent animal and human life, upon the planets other than our own. Much has been learned by means of the spectrum analysis, or the study of the composition of the rays of light reflected or emitted from various bodies through the spectrum—as to the composition of the solar and stellar bodies: as that our sun and the fixed stars of the heavens are bodies of fire or incandescent gases, at least so far as their visible surfaces are concerned; and that the *planets* constituting the several earths of each solar system or universe are existing in various states of fluidity or solidity, and in various degrees of heat or of cold, and surrounded with various atmospheric conditions so that the question has arisen whether it is possible that some of these planets can be the home of human beings—at least, of such beings as ourselves. Whatever we may know as to the gaseous or the solid ingredients of the various planets, we must know, experimentally or sensually, only through our sight, and this takes in only what is revealed on the outside of the body. It is not necessarily the body itself that we see, but what is reflected from the atmospheric or gaseous belt surrounding the body. Thus the magnificent planet *Jupiter* has been described by the astronomers as being in such a red hot and incandescent condition that it would be impossible for human beings to live upon it; but will this suit our judgment as to the superficial appearance of this great planet. Then comes the modifying reflections as to the cause of this appearance.



Thus the Astronomer Proctor finds it difficult to imagine that so grand an orb has been created for no special purpose other than merely to be looked at; and he concludes that its real sphere may be much smaller than the apparent size of its disc—an extensive cloud-laden atmosphere bounding the disc that we measure; and so a great difficulty is removed in considering the habitable nature of this planet, Dr. Whewell held that the belts of Jupiter are lines of clouds, and that masses of clouds would be raised by a watery sphere. He asks whether the surface of Jupiter itself may not be entirely watery, and, indeed, converted into ice. On the contrary, Mr. Proctor's fire theory would conclude that the actual globe of Jupiter was red hot; and now in turn comes the sensible suggestion of T. Norman Lockyer, that the planet Jupiter is surrounded by an atmosphere so densely laden with clouds that of the actual planet itself we know nothing. "If we suppose," he says, "that the apparent volume of Jupiter and similarly of Saturn is made up of a large shell of cloudy atmospheres and a kernel of planet within, there is no reason why the density of the real Jupiter and of the real Saturn should vary very much from that of the Earth and Mars." And this would save us from both the water planet and the red hot theory. "Moreover a large shell of cloudy atmosphere is precisely what our own planet was most probably enveloped in, in one of the early stages of its history.

"Whatever difference, therefore, may exist in Jupiter, either in physical constitution or condition from that of our own earth, it is no argument against it being inhabited, but only against its being inhabitable by races like the races upon our earth."\* Sir John Herschel, speaking of the diverse intensities of gravity in Jupiter, Saturn, Mars, the Earth, and the Moon, says:

"Under the various combinations of elements so important to life as these, what immense diversity must we not admit in the conclusions of that great problem—the maintenance of animal and intellectual existence and happiness which seems—so far

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\*Clissold: *"The Divine Order of the Universe,"* p. 105.



as we can judge from what we see around us in our own planet and by the way in which every corner of it is *crowded with living beings*—to form an unceasing and worthy object for the exercise of benevolence and wisdom which preside over all.”—*Outlines of Astronomy*, Art. 508. Professor Miller, of the Royal Astronomical Society, observes:

“At Jupiter there will be no possible changes of seasons at all; day and night will last everywhere just twelve hours; every region will be temperate; the climate a universal and perpetual spring.”

With regard to Saturn, Proctor remarks: “When we consider the analogy of our planet it seems impossible to doubt that Saturn is inhabited by living creatures of some sort. We may conclude that Saturn is uninhabitable by such creatures as exist upon earth; but there seems to be no reason for supposing that so far as these relations alone are concerned, the planet may not be the abode of living beings as high in the scale of creation as any which live upon our globe. We see that differences exist within the confines of our own earth which renders particular countries absolutely uninhabitable by particular races; but, on the other hand, these countries *are not uninhabited* or even less fully peopled with living creatures than seemingly more fortunate abodes.” As regards our own satellite, the Moon, notwithstanding Dr. Whewell’s interpretation of the telescopic appearances being against the Moon’s being inhabited, Sir William Herschel pleaded for its habitability. Proctor asserts that it would be rash to dogmatize about it so little do we know or can know. Sir John Herschel denies that there are any atmospheric conditions rendering life there impossible, and Sir. David Brewster maintains explicitly that the moon exhibits such proofs of an atmosphere that we have a new ground from analogy for believing that she either has inhabitants or is in a state of preparation for receiving them. Finally, in a citation of authorities Professor Miller declares that the plausibility of worlds is not a question for the man of science, but rather for the instructor, philosopher and the natural theologian. It belongs, he says, to the Religion of Astronomy, not to its Romance.

As regards the planets Mars and Venus, whose orbs are nearest our own, the lively investigations being carried on by the astronomers of our own days looking to not only a proof of them being inhabited, but to a possible mode of communication with the inhabitants, all go to declare the question of the habitability of the planets to be an open one for science as well as for the imagination, and to render the subject of the existence of life on those bodies and the character of their inhabitants a perfectly legitimate one for discussion in a scientific association.

It is quite true that there are scientists to-day who will stultify science by their insistence on a dead universe, as all that is exhibited to the eyes and intelligence of the inhabitants of our comparatively very insignificant body. I say "stultify" their science because such a doctrine stands directly opposed to the principles of evolution which regard the human as that plane of life toward which all creation struggles upward; and further, because it deprives the universe of a reason for being and a unity of purpose, according to which, or on the supposition of which, alone can any "functionating"—which means the fulfillment of an appointed use or purpose in any part of the existing world—be assumed.

As wide sweeping is the denial of planetary life by some of the authorities of to-day, they are all met by the equally confident assertion recently attributed to Professor Thomas,—Secretary of the U. S. Naval Observatory at Mare Island, "That there is not a planet in the heavens that is not inhabited."

Even so eminent an authority as Svante Arrhenius, the distinguished Swedish scientist, now lecturing before learned bodies in America, who is the editor of one of the volumes of the scientific writings of Swedenborg now being issued by the Royal Swedish Academy of Sciences, and who pays very high tribute to Swedenborg as the anticipator of many very important scientific doctrines—while he has spoken of the high temperature of the planet Mercury being such as could support no life, and of Jupiter and Saturn as having "no atmosphere," such as the inhabitants of our globe would appreciate, still, in view of the wonderful adaptation of human



beings even to the opposite extremes of our earthly temperature, and of the dispute of the scientists as to what we really know of the surface of the actual planets themselves as distinct from the sphere that we can see by our telescope, we may venture the assumption that even this high authority can hardly be said to have spoken the final word as to the possibility of human life even on those planets named by him. For the theory set forth by Arrhenius himself in his book published a few years ago on the beginnings of life in this our planet distinctly calls for the pre-existence of life on some of the other planets. This book, entitled "Worlds in the Making," treats of the formation of the separate planets and of the suns of the universe as a whole, without stepping beyond the plane of purely physical phenomena; and it gives Swedenborg his due place in the history of the solar vortices, dating Swedenborg's promulgation of the nebular hypothesis in 1734, thus long before its announcement either by Kant or Laplace; and what is of interest in this discussion, Arrhenius here announces his theory, which he calls *Panspermia*, and which holds that the entire interstellar space is filled with germs of life thrown off from suns or planets in some great collision or combustion, and that these germs, planted by meteoric or other means, have served to introduce the animal and vegetable species into the many existing worlds. If we bear in mind Swedenborg's distinct mention of the difference between the physical organization of these other planetary inhabitants and that of the occupants of our earth, we can see that even the conclusions mentioned by Arrhenius may not be regarded as necessarily restrictive of human life in some form; and that life germs sent off in "great combustions" may find a development in atmospheric and temperature conditions quite unlike those with which we are familiar here.

The Astronomer Serviss in his work on "Other Worlds" represents Mercury, Venus, Mars as having a hard, solid surface, and so differing from Jupiter, which presents to sight no solid crust, and which, therefore, "*perhaps*" has no solid nucleus at the center; although he (Serviss) has to admit also that "since the telescope is unable to penetrate the cloudy envelope we can



only guess at the actual constitution of the interior of Jupiter's globe." And he adds, that "it has been suggested that deep under the clouds of the great planet there may be a comparatively small solid globe, *even a habitable world*, closed round by a firmament all its own, whose vault raised some 40,000 miles above the surface of the planet appears as an unbroken dome." (p. 176.)

Further, in speaking of the planet Saturn, Serviss says, "Saturn does not appear, with our present knowledge, to hold out encouragement to those who would regard it as the abode of living creatures *except such* as pure imagination could describe." This exception sounds large, but really it is small, so far as depriving Saturn of inhabitants, for changed natural conditions will necessarily imply changed bodily constitution, sense faculties, breathing, muscular power, etc., and these, of course, if not actively seen must be *imagined*. If we take away from scientific description of the universe, all those parts which are beyond our sense's vision—all that which "imagination can alone describe"—there would be very little left for science itself to look at!

Finally, to quote the still more recent and notable utterances: Percival Lowell in his book on *Mars and Its Canals*, published in 1906, declares his assurance that plant life exists on Mars, and that it is what explains the dark marking seen on the planet. "And the ground for suspecting a flora leads us to suspect a fauna as well."

"All that we know of the physical state of the planet points to the possibility of both vegetable and animal life existing there; and furthermore, that this life should be of a relatively high order is possible." (p. 359.)

"That Mars is inhabited by beings of some sort or other we may consider as certain, as it is uncertain what those beings may be." (376.) Probably a "necessarily intelligent and non-belligose community," because living in mutual dependence and under a unity of order.

Further, in his "Mars as the Abode of Life," 1908, Professor Lowell says: "Martian conditions make for intelligence of a high order. Intercommunication is obligatory with them.

It is all land, no seas, and the struggle for existence is great and requires intelligence to cope with circumstances. . . . Their bodies it is hard to know, the last thing we are likely to know of them. We may learn much more of their mind as embodied in their works. And after all is not that the more pregnant knowledge of the two?" (p. 211.)

Still as a sad example of a science with no basis of unity, in a principle of the end, and consequently a mere mass of drifting, purposeless, hypotheses we read of the fate of Mars: "Life is nearing its end! It will dry up. Time will snuff it out. The planet will roll a dead world through space, its evolutionary career forever ended!"

It was indeed as an inductive philosopher that Swedenborg reasoned from the known fact that this earth is inhabited, and from the demand of reason that it was created for a purpose, this being none other than the desire of the Creator, for the satisfaction of his own love, to make a race of happy immortal beings, to the surmise that the other planets of our system, and of all solar systems, must be likewise inhabited. The probabilities of reason and analogy surely all lie that way, and, as we have seen, there are no final facts of science standing over against them. But beyond knowing something of the composition of other planets and even the possibility of their being inhabited, the great and far more interesting question, as Professor Lowell has said, remains as to the character, the life and customs of the inhabitants. The spectrum can tell us of the combustion of the sun, and mathematics can tell us of the position and courses of the planets, but neither of these can tell us of the mental and spiritual life of those who live there. To know them there must be something more than telescopes and figures. There must be communication between mind and mind. Such communication at the present day avails itself of means which once would have been regarded as miraculous. No clumsy ship is needed now to bring intelligence across the ocean from the other hemisphere; we do not have even to erect high towers and use some giant lenses to depict some loftily displayed figures on the other side; much more quickly and easily and silently the electric wave brings



the message, distance is almost annihilated, and through the wireless telegraph mind speaks to mind almost as if on waves of thought itself. And now that there are waves of thought by which in a vast mental world or universe of souls there are currents directed back and forth, regardless of material distances or other obstacles, seems to be the conclusion of the students of psychic phenomena, and so every prejudice, scientific and metaphysical, seems to be removed which may have stood in the way of our acceptance as entirely in the range of possibility, the statement of Swedenborg at the beginning of his work on "*The Earths in the Universe and Their Inhabitants*," and their spirits and angels described from what has been heard and seen.

Swedenborg says: "By the divine mercy of the Lord the interiors, which are of my spirit, are opened in me by which I can converse with spirits and angels, not only with those who are near our earth but with those who are near other earths. Therefore, because I had a desire to know of those on other earths and to learn their nature and the character of their inhabitants it was granted to me by the Lord to converse and have intercourse with spirits and angels who had come from other earths, with some for a day, with some for a week, with some for months. From them I have received information respecting the earths from and near which they are, the modes of life, customs and worship of the inhabitants, besides various other particulars of interest, and which, having come to my knowledge in this way, I can describe as things which I have heard and seen. It is to be observed that all spirits and angels are from the human race, and that they are near their respective earths and are acquainted with what is upon them, and further, that a man may be instructed by them if his interiors are opened so as to be able to speak and be in company with them, for man in his essence is a spirit and is with spirits as to his interiors."

Such, now, is the perfectly rational and highly simple and intelligible mode of communication by which Swedenborg claims to have obtained his intelligence regarding the inhabitants of other planets. His work has not been without interest



to the astronomers. Proctor, the author of "*Other Worlds Than Ours*," devoted a series of articles to its examination in the *Belgravia Magazine* in the year 1876, in which he brings forward the objection that Swedenborg if he had an actual knowledge of the planets would have mentioned Uranus and Neptune even before the latter had been discovered and named, and he could have said something of planets even beyond the path of Neptune.

The objection is typical of that class of scientific investigators which wonder that all minds are not absorbed in their own line of investigation, and that some can be interested in other things. The objection falls to the ground entirely when we reflect, first, that Swedenborg does give us an account of several planets or earths besides those named in our astronomies—which may have included both Neptune, Uranus and those of other systems beyond our own, and we may reasonably ask how could Swedenborg distinctly name certain spirits as "from Neptune" when as yet there was no Neptune so-called in all the astronomies!

Swedenborg lays down as a law of spiritual migration and approach in the spiritual world that these are according to states of desire and of thought. It is desire that prompts the motion, it is thought that makes the presence. It would be manifestly impossible to be drawn by thought into nearness to a special society of spirits of which there was as yet no thought.

We have now removed, I believe, the scientific barrier to one conceiving as possible the existence of human life upon the planets. But there remain other prejudices to be removed before we can judge upon their own merits the descriptions which Swedenborg gives of that life.

One is the thought that Swedenborg's knowledge would imply his actually having visited the planets in the body while living in this world, which would be nothing short of a miracle. This objection is removed when we find that Swedenborg nowhere claims any such bodily transportation to the planets which he describes, and that his speaking of going to them or being near them distinctly refers to his visiting the

company of the spirits of those who had dwelt upon these remote planets, which spiritual meeting or communicating, according to well known psychic laws, can take place regardless of actual distance or space, even while the appearance of spatial distances is preserved. Swedenborg's traveling far away to visit very distant planets means indeed a very real experience of *spiritual* change, which bears every appearance of *spatial* transportation; for whether in this world or the other our minds can possibly only think and experience under conditions of seeming time and space, that is, of succession and extension; but the real conditions there are determined by spiritual state and not by physical nearness or remoteness. We speak here of the "long way" from ignorance to knowledge—the long road to travel from states of unbelief and doubt to states of spiritual faith and certainty; the way is real and the road is long, but not to be measured by the surveyor's chain or by the hours of travel registered on the clock's face.

Again, if we arrive with Swedenborg at last on the promised border, and are ready to be introduced to these interesting newly discovered people, we must be content with what our guide permits us to see, for we are only seeing through his vision, and *he may be interested in looking up traits and customs* which are quite different from what our curiosity would seek out. It is the "shoemaker at his last" in every case. A hair dresser or milliner inquiring about a planet's inhabitants would be almost sure to ask different questions than would the manufacturer of mowing or thrashing machines or the publisher of books and newspapers. Swedenborg's inquiries were directed to those phases of life which were of the deepest, most vital interest to him; the mental quality, the neighborly disposition, the ideals and chief objects of living, the regard for God and eternity; these are what Swedenborg inquired about; and we must not be disappointed if he did not tell us about the minutiae of politics, or trade, or fashion, or invention. In the spiritual world, where all this traveling and visiting on Swedenborg's part took place, we must remember that external things take on appearances according to the state of the beholder, the thoughts already in his mind; and so what



is dim and uncertain may at first assume the appearance of cloudiness and obscurity, and especially what is unlike the ordinary human appearance or behavior may be difficult to describe in terms familiar to ourselves as built on an exact experience only. Let us now take up our journey.

## PART II.

Swedenborg's work on the *Earths in the Universe* is divided into two parts. The first treats of the earths or planets in our own Solar system; the second of certain earths outside of our system in that part of the Universe called the Starry Heaven. —*Coelum Astriferum*.

In writing of his visit to one of the earths in the universe he says that it was "further distant" from our earth than one previously mentioned, and he describes the going as of a "long journey;" and on his arrival he says he did not see the earth itself but only the spirits from that earth. He again speaks of the fourth and fifth "earth of the starry heavens" visited by him, as lying "far beyond our own solar system." Quite in agreement with the variety and the adaptation of the inhabitants to the various physical conditions of the several planets, we read of the spirits of one of the earths visited as being unwilling to think anything about the body or anything material, and that they consequently appear in the *sight of other spirits not in a distinct human form* but in a cloudy shape interspersed with fair human tints of color. They said that the men of their earth make no account of their bodies but only of the spirit in the body, knowing that the spirit will live forever but the body will perish. This little interview is sufficient to show that in Swedenborg's inquiry and interest the main thing regarding these other worlds was not whether they could afford a comfortable home for just such creatures as we are, but whether their life was human and devoted to human aims. These same spirits were shown, through Swedenborg's eyes, some magnificent palaces, such as those of kings and princes on our earth. But the spirits made light of them, calling them marble images, and described the more beautiful buildings of



their own, being their sacred temples, built not of stone but of wood. When they were told that these, too, were material objects they replied that they were not earthly but heavenly, because in looking at them they had not an earthly but a heavenly idea; believing, too, that after death they should see like objects in heaven." (150.)

Our time will admit of but a glimpse at the treasury of beautiful and deeply interesting revelation which this wonderful book of planetary travel affords. Swedenborg describes in some detail the spirits of Mercury, of Jupiter, of Mars, of Venus, and of the Moon.

Of the inhabitants of the MOON he says, their stature, appearance and voices are peculiar as belonging to a race adapted to entirely different physical conditions from ours. Of MERCURY he says that its inhabitants are profoundly interested in learning the interiors of things. They search into the thoughts and memory of those they speak with. They say they have no interest in things material and earthly, but only in things that are "real." They say they have no inclination to look at the sheath but at things unsheathed, thus at interior things. Their memory is of things, not of the material images of things. The whole account given of these Mercurians forms a most interesting psychological study full of illuminating suggestions regarding the nature of our own minds and thinking.

The longest account is that of the majestic and splendid planet JUPITER whose inhabitants he describes as of a celestial genius resembling in customs, appearances and religion those of that earlier or most Ancient Church on this earth, that which is symbolically described in the Scriptures as the Garden of Eden and known in mythology as the Golden Age. Their faces are fair and beautiful, sincerity and modesty shine forth from them; the lips are prominent because their language is effected chiefly by motions of the face and especially of the mouth. They find that food most savory to them is the most wholesome. The spirits of Jupiter do not find those of our earth congenial; we are too gross and take too much pride in mere external or affected wisdom. The conflict of personal

spheres which is very perceptible in this world is much more powerful there. All spirits and angels have their respective attitudes and functions in the Grand Man as the vast organization of all regenerating spirits which is formed, according to the Divine Creative idea, into the Image of God, the true Infinite and Perfect Man. The inhabitants of Jupiter have relation, in this great social physiology and psychology, to the *imaginative principle of thought*, and so to states of *interior activity*. But the spirits of our earth have relation to the various functions of the surface of the body, and when these have the control the action of interior thought is disturbed or suppressed. Hence this antagonism between the spirits of Earth and of Jupiter. The Jovians, as these inhabitants of Jupiter may be called, make wisdom to consist of thinking well and justly on everything occurring in life. Of such sciences as we have on earth they know nothing, nor have they a desire to know; they call them shadows, and compare them to clouds which come between them and the sun. They were led to this idea of earthly science by certain spirits who came among them boasting of their wisdom. This wisdom, it seems, consisted chiefly in things of memory, the knowledge of Hebrew, Greek and Latin, remarkable things of the learned world, in criticism, in bare experimental facts and in terms chiefly philosophical, not using these as means leading to wisdom, but making wisdom to consist exclusively in the terms themselves.

"The worship of the Jovian spirits consists in acknowledging our Lord as the Supreme who governs heaven and earth. Him they call the only Lord, and because they acknowledge and worship Him during their life in the body, they seek Him after death, and find Him. He is the same as our Lord. They say that He reveals to them how they are to live and how to believe. They do not know that their only Lord was born a man on earth; this, they say, it does not concern them to know; but only that He is Man and governs the universe. When I informed them that on earth He is named Jesus Christ, and that Christ means the "anointed" or "King," and that Jesus means "Saviour," they said they do not worship Him as a King because a King is wise in worldly things; but



they worship Him as the Saviour. Some of these spirits were with me while I read the xxii. chapter of John relating to the Lord's love and His glorification. Hearing this they were filled with a holy influence, and declared that all these things were true. They informed me that they have no holy days, but that every morning at sunrise and evening at sunset they offer holy worship to the only Lord in their tents, and also, after their manner, sing sacred songs."

The spirits from MARS are spoken of as a very high spiritual type. Their speech is by a kind of interior breathing and by expression in the face and eyes. They regard it as wicked to think one thing and speak another. These Martian spirits, we are told, have their situation in the organization of the Grand Man as between the intellect and will, consequently, as *thought from affection* and as *affection from thought*. They are most tenderly conscientious, taking care lest the lust of gain and the lust of dominion creep in and tempt them to deprive others of their possessions. Every one then lives contented with his own good, and with his own honor, namely, the honor of being regarded as just and as a lover of his neighbor. In worship they acknowledge and worship our Lord, saying He is the only God, and governs both heaven and the natural world; that everything good is from Him, and that He leads them; and that He often appears on their earth amongst them. This appearance, we are taught elsewhere, is by the deity assuming the form and presence of an angel, just as such appearances of God to men on earth are described in our Old Testament. The Martians are vegetarians, and clothe themselves with fibres from the bark of certain trees. They know how to make fluid fires, which afford them light in the evening.

A physical peculiarity of the planet SATURN is mentioned in the statement that the great ring which appears from our earth to rise above the horizon of that planet and vary its relations does not appear to the inhabitants as a ring but only as a snow white substance in the heavens reaching out in various directions. The Saturnians live divided into families, every family apart; the man and wife with their children. They

have little solicitude about food and raiment, feeding on fruits and pulse, and being slightly clothed with a coarse skin or coat, which keeps out the cold. They have no care for the body except for its life, which is the permanent thing, and for the service of God. Hence they care not for the body at death, but cast it forth or cover it with the branches of the forest trees. In the Grand Man these spirits of Saturn have their place in the middle sense between the natural and the spiritual man; but in that sense receding from the natural and acceding to the spiritual. "Thus they seem to be transported back and forth into heaven and below." This interaction of the spiritual and natural mind is illustrated by our life in this world where the spiritual may flow down into the natural and lift it up, but the natural of itself cannot flow into the spiritual. But when man is in a state of faith and thence in the spiritual life, then the spiritual mind flows down into the natural mind and thinks there; and from such thinking the man's life is lifted from the corporeal and material into the realization of spiritual things.

In the planet VENUS there are said to be two kinds of inhabitants, the mild and human and the savage and almost brutal. These latter are said to be on the side that looks toward our earth. Swedenborg did not converse with these, but only learned through the angels of their character. They are avaricious, greatly delighting in their spoil, and of gigantic stature. But these also can be saved, passing through terrible states of vastation and despair, even to extreme suffering. It was said that they in their earth had believed in a great Creator without a mediator; but when they are saved then they are instructed that the Lord alone is God, Saviour and Mediator. "I have seen some of them," says Swedenborg, "after they have passed through extreme suffering, taken up into heaven; and when they were received there I have been made sensible of such a tenderness of joy from them as drew tears from my eyes." The psychological function assigned to these spirits of Venus in the Grand Man is the *Memory of things material*, agreeing with the memory of things immaterial, which latter, is assigned to the spirits of Mercury. The



power of these material images of the memory, their tremendous force for good and for bad is fitly personated in these strange gigantic figures as here depicted.

Finally, as we have seen, the position of our planet in this great human economy of the universe is that of the outmost sensuous and corporeal plane of the mind corresponding to the skin, the outmost covering of our bodies and the recipient of the common sensations of an outer world. It is in these extreme planes of life that man could fall lowest into evil and sin, and hence it was *this our earth* that was chosen by the Lord as the world where He should put on human nature, and so, entering into all the evils that have beset mankind, could fight here in his combats with the hells tempting Him, not only the battle of our humanity, but of the human race in *all worlds in all spheres!* Here, too,—an achievement coincident with that of redemption by incarnation in our flesh on this earth,—the Word could be written, preserved, multiplied by the printing press, made manifest to all nations on the earth, to all gentiles and so, through spiritual communication, to all spirits and angels from other earths. So it is that in our planet the eternal Word was made flesh and dwelt among men: and its lines have gone forth into all the *earth*, its words into the end of the *world*. (Ps. xix:4.) It is this crowning doctrine showing the intrinsic reason of the divine incarnation here and not elsewhere, being grounded in the very organic form of the entire universe of worlds and in the doctrine of their respective relations and functions,—here it is that Swedenborg's work on "The Earths in the Universe" becomes not only what was called above the religion of astronomy, but the theology of astronomy, or that aspect of the universe of God's creation that alone is consistent with the belief in God as beneficent and as having a final purpose of good and of blessing in everything that He has made. For to quote in conclusion the summary of the argument set forth by Swedenborg in the beginning of this work:

"Any one who rightly weighs these facts—the immensity of the starry heavens with their innumerable stars, each of which is a sun like our own in the centre of its own system (of

planets or earths), must conclude that so immense a whole must have been the means to an end, which end is a heavenly kingdom in which the Divine Being may dwell with angels and men. For the visible universe or heaven resplendent with an innumerable multitude of stars which are so many suns, is nothing more than a means for the existence of earths and of human beings from whom a heavenly kingdom may be formed. A means so immense for so great an end was not produced for only one race of men, and for a heaven formed from them on one earth only.

“It is to be observed that the Lord acknowledges and receives all of whatever earth they be who acknowledge and worship God in the human form, since God in the human form is the Lord; and as the Lord appears to inhabitants in the earths in an angelic form, therefore, when the spirits and angels from these earths are informed by those of our earth that God is actually Man, they receive that Word, acknowledge it and rejoice that it is so.”

Such, then, is the voice of praise and worship which, could our earthly ears perceive, is still that which the “morning stars” are still singing together in adoration of this mighty and beneficent Creator, and of which the inspired Psalmist on our own planet was enabled to say: “The heavens declare the glory of God; the firmament knoweth His handiwork; day unto day uttereth speech; night unto night declareth knowledge.

“There is no speech nor language where their voice is not heard!”



## THE SENSES.

TRANSLATED BY E. S. PRICE, A. M.

CHAPTER VII. (*Continued.*)

**625.** *Then, into continued series, greatest things from lesser and lesser from least; thus quantities and their varieties arising from differences of degrees.* 1. That is called a continuous series which is subject to the universal, and its determinations proceed from greatest to least things, or to unities. 2. In unities occurs the higher, superior or prior series; 3. and so forth. 4. From the posterior to the prior, as from a square to its root, is not called a continuum; but it is called a double ratio, then a triple. 5. Nor are they homogeneous, that is, they do not spring from the same unit. 6. Greatest things enter the sphere of the mind first; 7. but unless afterwards lesser things also enter, the mind cannot know of what quality this greatest is; 8. thus it cannot know the essence and nature of water, or air, from its smaller volumes in their order, and from drops. 9. The least thing passes outside the sphere of sensation, then the mind explores it by the greater things, but since the nature of a unit is like that of a volume, it thence follows as a consequence. 10. But indeed when the mind explores synthetically, it tends from parts to the greater, for its compound form must consist of parts. 11. Thus general truth is known from particular truth.

**626.** *Thus simultaneous from successive things.* 1. Successive things belong to celerity and space, wherefore to moments and degrees, 2. wherefore through intervals. 3. At first those things appear to be understood which enter as simultaneous things; 4. but from successive things it is discerned of what quality the simultaneous is, or what is in the simultaneous. 5. Thus successive things ought to be in the mind, before simultaneous things, whether they be in relation to time or in relation to space. 6. There is nothing simul-

taneous which has not previously been successive in nature. 7. There are like harmonies and ratios in each. 8. But indeed while the mind progresses in a synthetic way, then the simultaneous occupies the first part, or, the conclusion the general parts. 9. This is evolved like an algebraic equation into its own successives; 10. on which account determinations become acts.

627. *Things present from things past, and may conclude contingents rationally from each;* 1. not indeed future contingents; these belong to the Divine Providence; 2. but those contingents that follow from natural necessity and the nexus of causes. 3. For certain contingents are necessary, and then they put off the name of contingents. 4. Certain contingents are to be divined, certain ones cannot indeed be divined. 5. Things past give light to things present, that is to say, both historical and analytical things. 6. If we understand all those things as present, which are present in the memory, 7. then we understand all those things as future, which can be brought forth, or which are brought forth analytically, 8. thus truths and goodnesses not yet explored. 9. The use of this ratiocination holds every point in politics, economics and civil life.

628. *This [exploration] is first in an analytical order, afterwards in the inverse or synthetic order.* 1. I do not speak of inmost sensation, which first perceives generals, 2. then distinctions between generals, afterwards the parts of generals; 3. for the first notion thence arising is obscure, which thus comes forth distinct; 4. for all things enter into the sphere of the understanding through sensation; thence they proceed further where they are digested. 5. Thence is the sphere of the memory, which properly belongs to the understanding; 6. that is to say, which holds back those abstract or universal things from the limits of inferior things. 7. For the memory consists of mere mutations of state by habit induced from the inferior fields; hence also, since these are changes of state of the intellectual sphere, the superior memory is to be ascribed to it. 8. But when things of the intellectual memory are revolved, which are revolved at the



same time with things of the imaginative memory, as at the same time with its general things, then those things are called forth which distinguish generals; 9. thence generals are born, what they are and what quality they are. 10. There is an equal ratio of universals. 11. Thus the mind proceeds by an analytical manner to forms of truths, that is to say, from the posterior to the prior, 12. or to generals and universals to be formed agreeably to those things. 13. In this way truths are first sought out, unless a faith of authority be seized upon as true. 14. These things being given as truths, thence the affection of some goodness is excited according to the perfection of the form, 15. and thus a soul is added to the thing or it is sought out. 16. This soul being given, the understanding progresses according to its synthetic custom, or from the prior to posterior things, for the purpose of placing goodness; 17. and thus the nature of the soul, as it were, operates in its body. 18. Indeed, they can be so assimilated that there is always something left to rational analysis and something to synthesis, or something to will and something to nature, 19. so that the mind may apply everything which anatomy detects, and those things which concern the operations of the mind. 20. For a like mode of acting reigns everywhere, 21. to detect which is the purpose of this work.

629. *And indeed is after the manner of rational or logical analysis, as also of geometrical or specious\* analysis; the former of which leads its ratios to conclusions, the latter, however, to equations:* 1. Logical analysis, as is known, operates through various series of consequences, whence a conclusion is formed. 2. Every consequence had been a conclusion either detected previously from other consequences, or accepted at the mouth of others as a true conclusion. 3. In consequences are assumed those things which cannot be denied, otherwise they are to be demonstrated. 4. Wherefore all things which enter in must be truths. 5. The conclusions themselves are in succession put back into the place of consequences, thence a new conclusion is formed, 6. and so forth;

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\*Specious, having relation to the look of a thing.

even up to no boundary within nature. 7. Such logical analysis is natural to us, in order that the mode of proceeding may be rational and at the same time natural; 8. wherefore every single mind operates thus without scientific and artificial logical analysis. 9. All consequences are successive, but are represented in the conclusion as simultaneous. 10. While thought is being revolved, it proceeds through such series; the terms themselves are called forth from the memory, but the operation and connection are natural; 11. for there is a perpetual induction, production, and edification or creation, as has been said before, in imitation of the order of the universe. 12. Analytical or algebraic calculus proceeds in a similar manner; 13. it assumes things known and unknown and from things known it wishes to explore things unknown; 14. at first it proposes what is to be explored; 15. it seeks out the known ingredients and easily arranges them into a certain order; 15 [a]. then it computes and turns, cancels many, subtracts, multiplies, divides and adds; 16. then finally it comes to some conclusion, which is called an equation, consisting of mere signs; 17. in this equation it looks at what is unknown placed on the opposite side, which signifies the same; 18. indeed it binds many equations into one or arranges many, whence it sees the relation and mutual regard of each one. 19. Rational operation proceeds similarly.

**630.** *Then conversely, it resolves conclusions and equations, and determines them to the ends to be pursued.* 1. And this is done in a synthetic manner; 2. for thus only does it arrive at the science and cognition of truths. 3. But one conclusion can be resolved, as can every equation, into its own analogies, and these into ratios, wherefore into new equations, 4. as will be seen better below.

**631.** *Thus truths, into which the same number of simpler truths enter as essential determinations, are brought forth as analytical forms.* 1. There is a similar mode and similar ratio of proceeding in truths which are to be sought and in forms which are to be determined; 2. although the one is in an inferior sphere, the other in a superior, 3. and although the one is physical or natural, the other moral, and the other spiritual.



4. They mutually correspond to each other, with a difference only of perfection, 5. as will be seen in the doctrine of correspondences. 6. Wherefore since the one is in a superior sphere, the other in an inferior, like significative formulas do not agree; but ascend to superior nature.

**632.** *By these means the mind arrives at the cognition of good and evil.* 1. Good and evil is something distinct from truth, 2. for as rational ideas form truths, so these again form goodnesses. 3. Goodness, which is in truth as its form, is not the good which is sought, but is a certain perfection, which affects as well by itself, as that in it we look at the good which is sought; 4. wherefore without truths at first sought out we do not arrive at good, still less at the choice of good. 5. Thus the good which is sought will be the soul of the truths. 6. That it is good, nothing manifests, not in all nature nor in our very selves; 7. wherefore our whole inclination tends to the good to be pursued; 8. its opposite is evil; 9. wherefore there are relations between good and evil, 10. as between better and best. 11. The best seems to be that good purely without evil. 12. But still a kind of harmony between good and evil is required, in order that good or the best may become sensible by relation. 13. Goodness itself therefore is to be sought, or the quality of good. 14. All such inquiry pertains to truths; 15. for truths are mere determinations, which form good; 16. for good is as an end, or use, and truths as essentials; thus from the determinations of essentials, good flows as an end; 17. wherefore the relationships of good and truth can thence be known, namely, that good reigns in the universal determination, as the end and use in the things fabricated. 18. If the end or use is not known, the fabric is to be unrolled, and the use thence interpreted, and that indeed from the evolution of many uses in the series; 19. for there are the same number of goods in truths, as uses in causes and effects; 20. wherefore truths are to be compared with causes and effects, while the goods which are sought are to be compared with uses. 22. But if uses or goods are known, then truths are only to be evolved as forms or fabrics, and it is to be seen how they

produce good. 23. This is called the confirmation and demonstration of goods; 24. just as has been said in our anatomical inquiries; only in place of truths we suppose the determinations of a tissue, and in place of goods its uses. 25. Also the uses themselves are goods, because they are ends.

**633.** [*The mind arrives at a cognition of good*] *as well natural as moral, and finally spiritual.* 1. Natural goods are many, yea, innumerable. 2. They are all things of the world that affect our senses and present uses. 3. Also all things of the body that affect our imagination. 4. These natural goods also affect the lower part of our understanding, for they fall under its sensation. 5. Whether they be truly good is to be learned not from sensation but from use; for use goes *pari passu* with good. 6. Moral good is what regards others outside ourselves, that is to say, societies lesser and greater; 7. but with respect to ourselves we are its subjects. 8. Moral good has respect especially to virtues and vices, that is to say, to morals. 9. These nevertheless are nothing except in respect to the subjects towards which they are exercised; 10. for we can perform to society natural, moral and spiritual goods. 11. All these goods are in every subject, and among the subjects. 12. Spiritual good has respect especially to the soul, its state, and heavenly society. 13. Its ultimate and supreme is in the highest degree good itself, the very essence of good, that is, God, from whom every good descends. 14. Thus goodnesses are inferior, superior and supreme. 15. Of what quality the representation is between these goods will be seen in the doctrine of representations. 16. It is only this, that they ascend in perfection and truth, as through degrees, to superior things.

**634.** *And this to the end that we may know how to choose the best.* 1. This is the cause of our understanding, 2. and that we must ascend by the analytical way to that cognition, even to choice. 3. Our understanding does not go farther than to the cognition that spiritual good is the best. 4. But how it may obtain it is not the part of the understanding; 5. for it is not affected by that goodness, because it does not fall into the sphere of its sensation; 6. wherefore there is required an-



at new objects; but in these objects there is one reigning and universal object.

other and superior power which must by all means flow in, 7. not only that it may know truths, but also that it may pursue goodnesses. 8. What is superior must flow into the inferior, not the reverse. 9. But there is a best in natural, in moral and in spiritual things: thus the best in natural things is not any particular thing, unless taken universally, but one thing is the best under certain circumstances, another under other circumstances. 10. Thus goodnesses are respectively related to each other; 11. so also in morals. 12. Of all things, however, there is one thing in the highest degree good, or supreme, that is, God.

**635.** *Wherefore also to the end that we may know how to inquire after, judge and choose mediate ends, which lead to the ultimate or best, and to its consequence and fruition.* 1. This is, as it were, the second or third part of the understanding; *the first* is to explore good by truths by the analytical way, and to refer it to the choice or will. 2. *The second* is, goodness being given, to confirm and demonstrate it further by the synthetic way; for, the end being given, then the end reigns like a soul and clothes itself with truths, and confirms itself thereby; 3. it is only the inverse order to the order of operation in the understanding. 4. *The third\** is to explore things leading from the mediate to that end. 5. Thus a new intellectual field occurs here; 6. the former is only theoretical, but the latter is practical; 7. but the mode of proceeding is similar; 8. for goodness is posited as received; 9. then its consequence is analytically sought for, that is to say, its order, mode, time are considered, 10. thus it is judged; 11. and, being judged, it is referred to choice, thus determined into act; 12. for every single intermediate end is sought for as an ultimate end. 13. For these ends are by the mediate placed in the ultimate. 14. Thus, since there are infinite ends leading to the ultimate, and a perpetual series and chain of ends, therefore there is a perpetual rational analysis, 15. which always looks

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\*The Latin has *quarta* (fourth).—Tr.

**636.** *This is the work of science and wisdom.* 1. It is the part of science to arrange the means in an orderly manner. 2. It is the part of wisdom to direct those means to what is best. 3. This could not be done without Divine influx.

**637.** *To the extent that we are affected by the love of the truly good, and especially of the supreme best, to that extent we are united thereto.* 1. For love is spiritual conjunction; 2. wherefore the one being posited the other is posited; 3. as has been shown above. 4. What the means are that we may be affected by the love of the truly good, is not the purpose of this discussion; 5. for those means occupy the whole of supreme or theological science.

**638.** *And to that extent the state of our mind and soul is rendered more perfect and happy.* 1. That every change of state altogether follows affection, has been frequently shown above; 2. for there is everywhere an obvious consequence, thus one confirmed and demonstrated. 3. The union of the best cannot but render our state more perfect; 4. wherefore, happier. 5. But the union is such as is that of the superior with the inferior. 6. This union is to be treated of in the doctrine of influxes.

**639.** *From the above it follows, that the primary end of the understanding given to us is, that we may ascend by degrees from moral into spiritual life.* 1. These things have been treated of in the Epilogue of part Second of the Animal Kingdom. 2. The ends of exploring truths, and the goodnesses of truths, and finally of choosing the best are only intermediate ends. 3. But this is our ultimate end, 4. which involves the ultimate end of universal creation, which is the glory of God.

**640.** *Thus finally to heavenly happiness, which is a perpetual continuation of spiritual life.* 1. We can by no means arrive at spiritual life of ourselves; 2. for spiritual life consists of the love of the highest good, that is, of God Himself, and of His Love, which is in Christ Jesus. 3. We cannot of ourselves mount up farther than to the love of ourselves. 4. This love is adjoined to every intellectual sensation. 5. Every inferior love extinguishes the superior, and, conversely, the



superior, the inferior ; there is a perpetual collision, and finally an extinction of the one, that the other may triumph. 6. The love of the world, of the body, of the goods of the world, that is to say, avarice is altogether repugnant to the love of self. 7. The love of self or of one's own glory, of fame, of the mind, of the faculties entirely extinguishes avarice. 8. But superior love or love of the highest good, which is truly spiritual, extinguishes the love of self, and induces humiliation so that one regards oneself as nothing. 9. Thus where natural life is supreme, there divine spiritual life cannot be ; 10. wherefore the love of self must first be extinguished. 11. Since this does not fall under any sensation it is not the part of our powers to assume that extinction, but it is of the Divine beneficence ; 12. wherefore it is necessary for the love of self to be extinguished, and ourselves thus regenerated ; 13. wherefore without regeneration by the Divine Spirit or the Spirit of Christ. we can by no means enter into the kingdom of God. 14. Thus one cannot be regenerated unless the interior man die. 15. What is in the soul itself is above the sphere of our understanding. 16. When the interior man dies then first some sense of that love or a certain superior happiness is born, 17. which emulates heavenly happiness, although obscurely. 18. Thus this new life is perpetuated ; 19. but it supposes the extinction of natural life or that of the body and imagination, which continually fights against it. 20. Nor can there be any conception of the nature of that heavenly happiness ; wherefore we cannot aspire to it through the ideas of our understanding. 21. We have no conception of the nature of this life than that it is the greatest happiness ; but whatever may be the happiness, it is nought, without the love of the best ; thence is the origin of all felicity, and therein the sense of all that is pleasing ; 22. for we have not yet learned by the sciences that the life of the superior degree exceeds the state of this life as the superior exceeds the inferior, 23. to the extent that the greatest perfection of this life can scarcely be compared with the least perfection of the superior life. 24. This thing no other doctrine than that of order and degrees can teach. 25. This doctrine gives to the understanding its idea, but it does

not so well persuade as when the experience of the senses or of perception is added. 26. There is no perception of it except an obscure one, as has been said, but it is sufficiently manifest in those things in which the love of self and of the body has died; 27. wherefore it is a continuance of the life begun here; 28. that it will be immortal is most evidently proven, if only doctrines have been premised; these all manifestly persuade.

#### CONCLUSION.

641. The understanding with its faculties, or the rational mind, is therefore granted to the human race, that it may be able to explore truths, or to rationally bring forth universals from singulars, and generals from particulars, wherefore causes from their effects, or priors from posteriors, genera from their species, and species from individuals, thus varieties from differences, wherefore qualities, accidents and modes from the essences and nature of the operations; then in continuous series greatest things from least, and lesser from greatest, thus quantities; simultaneous from successive things, present from past things, and contingents from each. This is done first in analytical order, afterwards inversely or in synthetic order; and, indeed, after the manner of rational or logical analysis, as also after the manner of geometrical or specious analysis,\* the former of which leads its reasons to conclusions, but the latter to equations, then in reverse order solves the conclusions and equations, and determines them to the ends to be sought. Thus truths are brought forth as analytical forms into which the same number of simpler truths may enter as determinations; by these means our mind leads itself to the cognition of good and evil, both natural and moral, and finally spiritual. This is to the end that we may know how to choose the best, wherefore also to inquire after, judge and choose mediate ends, which lead to the ultimate or best, and to its consequence and fruition. This is the work of

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\*See note to n. 329 above.—Tr.



science and wisdom. To the extent that we are affected by the love of the truly good and especially of the supreme best, to that extent we are united to it, and to that extent the state of our mind and soul is rendered more perfect and happy. From these things it follows that the primary end of the understanding given to us is that we may ascend by degrees from natural into moral life, and from moral into spiritual, and thus finally to heavenly happiness, which is a continuation of spiritual life,

[The end.]

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## THE FIBRE.

TRANSLATED BY THE EDITOR.

### CHAPTER X.

#### ON THE SUBSTANCE, FABRIC AND POROSITY OF THE NERVES, AND ON THE PASSAGE OF FLUIDS THROUGH THEM.

188. *When cut transversely, the nerves, seen by the glass, appear like a sponge or bulrush, pierced by distinct passages. That the nerves are fistulous and pervious cannot be doubted, unless we call ocular experience into doubt. But while the nervous bodies are still stopped up with their humors, these cavities are not easily detected; for the continuous and coherent parts which constitute the tunics, especially the tunics of the fibres, are hardly discernible from the contiguous parts, that is, from the fluids, which flow through them and between; for the verimost simple fibre which is the all in the compound fibres, is far removed from the sight of the eyes, as will be confirmed in the following pages. Therefore the nerve is seen to open up and distinctly exhibit its cavities to the sight only when it*

has been dried out for some weeks. This is confirmed by the most experienced investigators. Thus Willis says "The nerves themselves, as may be seen by the microscope, are furnished throughout with pores and passages, as with so many cavities thickly set in, and mutually contiguous. Thus their syringe-like substance, like bamboo, is everywhere porous and pervious," (n. 8.). It is the common opinion of all investigators that animal spirit flows through the nerves with the utmost freedom, and it is because of this that Descartes supposes that the nerves have valves,—a supposition mentioned by Bartholin, together with his own strictures thereon, see n. 13. In respect to the porosity and permeability of the nerves, there is among the learned, no more sharpsighted and deeply inquisitive investigator than Leeuwenhoek; for this observer has set under his microscopes nerves that were first dried out, and were then dissected at various planes, and in some of his figures he shows their structure with the interstices between them; see his figures, 1, 2, 3, 4, 5, 6, 7, 8, and the descriptions thereof in n. 27, 28, 29, 30, 32, 33, 34, 35, 43. The reader should examine all these figures and read the descriptions before he accompanies us any further.

189. *Wheresoever in the body there is a nerve, it is made up of fibres, fascicles of fibres, tunics, and connections; and it arises from the cortex or gray matter of the cerebrum, cerebellum, medulla oblongata and medulla spinalis, and is produced and continued through their medullary substance. That every fibre springs from a gland of the cortex, has, I think, been sufficiently confirmed above; moreover those who, as far as possible, have made examination of the matter with their own eyes, are of the same opinion. This, then, is a description of the nerve from its origin or genesis.*

190. *The fibre is the principal substance of the nerve. Crowded together, fibres constitute the very body or medulla of the nerve. A larger or smaller number of fibres covered over with a common membrane, forms a fascicle, also called a nervule and the beginning of a nerve. Such fascicles, compacted within a still more general tunic, produce an entire nerve. When such nerves are brought together under a most*



*common sheath, then arises a nerve trunk, such as the sciatic nerve and the brachial. That such is the composition of the nerves, is evident from dissection of the several nerves. Simply consult the famous investigator, Leeuwenhoek, and his figures. That such is the fabric of the nerves, is also clearly evident from their coalition at the point where they arise, and are inaugurated into their use; for delicate fascicles or beginnings of nerves go forth from the medullary stem where they have their origin, and a number of such fascicles converge together under a common tunic drawn from the dura mater.*

191. *Thus we see that a nerve, like all other created bodies in the universe, grows by degrees from its lines, simple substances or fibres, into its dimensions, and springs up distinctly in a three-fold way into a body. That the lines or fibres also arise from their points multiplied together and drawn out lengthwise, is clear from the origin of the simple fibre. These particulars are conformable to purely geometrical principles, since, for the existence of a line, there must first exist a point, for the existence of an area, there must by all means be lines, and for the existence of a cubical body, we must have areas; for it is the multiplication of points, lines and areas that produces dimension. In order that we may obtain the square of a cube, and the cube of a cube, it is necessary to assume cubes as simple substances or points. So in all respects is it in the nerves.*

192. *How fistulous and sparse is the structure of a nerve is clearly evident from what has been shown above; for the fibres themselves, [of which the nerve consists] are pervious and channeled. See above, n. 142. There are interstices between the fibres, and still larger interstices between the fascicles of fibres; for fibres are little canals not agglutinated with the neighboring canals, and fascicles are smooth cylinders distinct from the contiguous cylinders. There are some who have imagined that a cavity goes through the middle of the fascicle as is the case with an artery, but this view is not supported by experience; for the fascicle is permeated, not by a single cavity, but by innumerable cavities. It is, indeed, possible that a*

somewhat more ample space may be formed in the middle of a nerve, caused by stagnant serum, or by the swelling of the vein that runs through it; but this is unnatural and no induction can be made from the unnatural to the natural. That there are passages between the fibres, and between the fascicles of fibres, is shown by the mere geometrical figure of these bodies; for when little canals and smooth cylinders are joined together they must necessarily give rise to some intervening space, and unless this space were permeated by fluids, the sides would certainly coalesce and become entirely collapsed, an eventuality which is contrary to experience. The reader should here carefully examine Leeuwenhoek's figures 1, 2, 3, 4, 5, 6, 7 [n. 29, 30, 32, 33].

193. *Inasmuch, therefore, as each fibre and each fascicle of fibres flows from its own proper origins in the brains, and goes down to the performance of its own proper offices in the body, it is necessary that each fibre and each fascicle be distinct from its accompanying and neighboring fibres and fascicles, and be non-contiguous thereto except at the points of contact. Otherwise the several forces and actions would coalesce in a confused manner into one general indistinct force and action. And, therefore, in proportion as one fibre in its action is distinct and free from another, and one fascicle from another, the better is its condition and state, and, consequently, the condition and state of the whole kingdom; that is to say, the more obsequious the muscle to the decreass of the brain and of nature, the more apt the gland for the purification, separation and commingling of liquids, the more prone the artery to the fulfilling of its systoles and diastoles, and the more suitable and accommodated the organ for receiving sensations, transferring them, and distinctly representing them in the cerebrum. Such is the state of the fibres, fascicles, and nerves in the flower of youth, but it is wholly different in the winter of old age. For old age arises from an obstruction of the arterial and venous capillaries, and the coalescence of the fibres and fascicles; hence the fibres, both the muscular and others, acquire a hard and tendinous nature, the consequence whereof is that the several forces no longer enter into the gen-*



eral force; and according as the forces are, such is the resultant action; therefore is old age so far removed from the vigor of youth.

194. *As many, therefore, as are the apertures lying open in a cross section of the nerve, so many are the pathways constructed for the fluids. But to investigate the nature of the fluid which runs through the fibre, of that which runs through the interstices of the fibres, and of that which runs through the interstices of the fascicles,—this is a work, and here is labor (hoc opus hic labor est). It is an evident truth, however, that the humor permeating the spaces between the fascicles is not the same as that which permeates the little spaces between the fibres, nor the same as that which permeates the little channels of the fibre. But, from a diligent consideration of the several points, it seems possible to conclude that: through the interstices of the fascicles flows the genuine serum of the blood, impregnated with urino-saline or fatty particles; between the little interstices of the fibres, a highly rectified humor rich in ethereal and subtly sulphureous principles and elements; and through the fibre itself, that middle vital essence which is called the animal spirit. But as to the origin and nature of the one humor and the other, this is not a matter to be learned by light study, nor to be delivered in a few words; nevertheless we may be permitted to make the attempt, for otherwise we shall not reach the end or goal. That these passages are traversed by humors of diverse character, may be argued from the diversity in the situation and figure of the several parts, and from many other indications. For the more ample the space, and the more remote from the centres, the grosser the humor; thus the most chastened humor, the loss whereof is most greatly to be feared, must necessarily flow through the middle of the fibre. In the meantime, we may form a judgment from the tunics and walls as to the nature of the fluid that transpires through them; for the fluid, which is prior both in time and in nature, constructs for itself pathways and accommodates them to itself. Trans. I., n. 134, 135.*

195. *But before entering this field, it is necessary to minutely search into the nature of the fabric and porosity*

found in the medullary substance, and of that found in the cortical substance of the cerebrum, cerebellum, medulla oblongata and medulla spinalis. For it is from this origin that the fibre is drawn, and from the same origin is introduced that humor which penetrates the spongy bodies of the nerves; for the two mutually correspond to each other; and in the nerve is presented the effect, which is the continuous effect of its cause in the brains.

196. As regards the fabric and porosity of the MEDULLARY SUBSTANCE, its fibres and vessels mutually consociate, and distinctly enfold themselves into reticular plexuses; for there are lesser plexuses within the larger, and each is girt about by the softest little membranes. See what was adduced above, n. 131. Hence arises a structure, loose, spongy, pervious to lymphs, bibulous, soft, capable of expansion, free to act, and peculiarly suitable for building up the nerves; see above, n. 132. Thus it is apparent with what distinctness the cerebral medulla conducts to the lattice-work of the nerves, the humors received from the cortex. For each fibre, there most freely fluent, transmits its own spirit; each lesser plexus woven of the loosely fluent fibres, pours in, between the fibres of the nerves, a humor of the utmost purity; and each larger plexus pours in, between the fascicles of fibres, its own oleaginous serum. And to the end that these liquors shall not break away from the paths marked out for them, the several plexuses are surrounded and guarded by a delicate tunic. When these plexiform fascicles emerge from the medullary stem, they are first surrounded by a fine meninx, and afterwards by a hard one. Thus the most diligent care and precaution is taken to prevent the enclosed humor from flowing off elsewhere, and to ensure its being determined by distinct paths into the corresponding pores of the nerve. Nature also, from the very cradle of the fibre, strives after the same effect; for the several fibres, new-born from their cortical glands, quickly join company and submit themselves to a common covering. Thus the fabric and porosity of the medullary substance in the brains corresponds to the fabric and porosity of the nerves in the body; nor is there any other difference between them, except that the fibre



of the brain flows much more free of action, while the fibre of the nerve, being more closely compacted, is coerced by bonds, to the end that it may serve and minister to the brains. Confer the observations made above, n. 193.

197. As regards the CORTICAL SUBSTANCE, from which, as from their beginnings, the fibres flow down, and from which, as from their fountain, the humors are derived,—each of its glands is separated from the neighboring glands, and circumscribed by a little space; and each of its lesser congeries or clusters is ditched about by fissures and little furrows; and each larger congeries or cortical glome, is surrounded by deep and winding fossæ. This is evident from a mere inspection of the cortex; for as to the separation between the glands, this has been proved by Vieussens and other anatomists by means of their inky injections [n. 17]; and as to the fissures and sulci which distinguish the clusters from each other, this is plain to be seen on a mere division of the parts in boiled brains; confer Trans. II., n. 135. Thus the cavities found between the fibres and between the fascicles of fibres, and finally in the nerves, take their origin all the way from the cortical substances, and are continued into the nerves. The cortical gland itself is furnished with a little follicle or minute chamber, through which the middle vital essence, that is, the animal spirit, transpires into the medullary fibre of the brain, and the nerve fibre of the body. From the space which circumscribes the gland, a highly chastened humor, rich with principles and elements subtly sulphureous and ethereal, flows down between the fibres; for no other way is open to it; and therefore each gland is seen constantly anointed by a moisture of this kind. This is confirmed by Pacchioni, who says: “If you touch the cortex of the brain with your fingers, you will not fail to notice that it is extremely smooth as though suffused with a most subtle oil, a fact which I have learned, not without admiration, from a vast number of dissections of cadavers.” (Trans. II., n. 88.) And, therefore, Leeuwenhoek calls this substance not only vitreous, but also oleaginous; and he states that it gives off an odor of sal-ammoniac [n. 22]. Moreover, if a substance so prone to agitation and

animation, were absolutely dry, it would be rendered impotent of action, and become coalescent with the neighboring substances. *From the fissures and commissures whereby the larger congeries of glands are discriminated, there is derived a genuine serum, impregnated with urino-saline and fatty parts, which flows between the fascicles of the nerve fibres. For this purpose the arachnoid tunic is extended over the pia mater, in order that it may pour on a lymph of a better quality.* That the arachnoid tunic performs this use, will be seen in the following Transaction. [n. 352-354 below.] For the rest,—that the pia mater perpetually expires a most subtle dew, is confirmed by much testimony by Pacchioni, Ruysch and other anatomists; and that the medulla assiduously receives the humor of the cortex, and the nerves the humor of the medulla and transmit them to every point, see Boerhaave, n. 49, *sup.* *But humors of a grosser character, namely, those serous and pituitous humors which crowd the winding fossæ, are carried down the larger plexuses of the medullary substance, and by means of animations or alternate expansions and constrictions, are urged on to their outlets which have been constructed by nature.* This is plainly to be seen in brains, and also in subjects laboring under cerebral dropsy; for the medullary substance, being loose and patulous like a sponge, receives the purer juices within the structure of its plexuses, but the grosser between the plexuses themselves, that is, in the interstices shown in Fig. 14 [n. 40], by H, I. When, therefore, this somewhat gross and pituitous humor penetrates the plexuses, it inevitably falls into the larger interstices of the nerves, whence arise inflammations, swellings, and certain kinds of paralysis; but when, on the other hand, the humor enclosed in the plexuses escapes, by the laceration of the tunics, into the larger spaces I, H, the result is that the lack of such humor in the nerves gives rise to torpor, impotence, emphraxys,\* etc. As to the outlets constructed by

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\*The total obstruction of a cavity or canal by matter of a viscous nature. The name is derived

from a Greek word meaning to obstruct.



nature and to which this pituitous humor is urged, this will be explained in the Transaction on the Brain.\* Thus the cortical substance corresponds in all respects to the medullary, and the medullary to the nervous; and, by the principles or beginnings, everything is provided which conduces to the effect.

198. *But it is asked, Whence come such diverse humors? What is their nature? By what force are they carried down into the nerves and through them? and What use do they perform?*

199. *With regard to the first question, WHENCE COME SUCH DIVERSE HUMORS? It is well known that a better, lighter, softer, and more perfect blood is continually being drawn up towards the brains, and this through the carotid and vertebral arteries, which after constant ramifications, approach and enter the very glands of the cortex. Hence it follows that these diverse kinds of humor spring solely from the blood. If now we consider the globules of the blood as to their inmost structure, it will become evident that each globule carries in its bosom all those kinds of humors that are transmitted through the pores and passages of the nerves. Thus it is apparent how important it is to know what is the structure of the blood globule, and what the principles and elements of which it consists. Microscopic experience has already opened to us the way almost to the inmosts; and it has taught us that a globule of red blood is made up of smaller globules and these again of globules still smaller; and that these several globules are bound together by suitable particles, taken from the kingdom of salts and sulphurs, whence results the spherical shape of the blood, its redness, gravity, heat, volubility, flexibility and solubility. The composition of the blood globules has already been treated of at length in Transaction I, where it was shown: That in the blood is contained whatsoever exists in the body, n. 2, 3, 5, 59-61, 115. That in its globule are contained many kinds of salts, n. 43-45, 91, 92. Concerning its composition in particular, see n.*

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\*Cf. THE BRAIN, n. 578, 581g, 593, 595, 597, 598, 600, 602a, g. h.

91, 92, 95, 96, 188, 371. That the blood globule consists of six other globules, and these again of many smaller ones, was seen by Leeuwenhoek with his glass, and he gives a delineation of the globule itself, [n. 22, and Trans. I, n. 29-30]. To the above it remains only to add, that in the blood globule are found saline elements, but not lymph; for the latter serves as a vehicle, and carries to the blood the things of which the blood is constructed. This lymph, impregnated with saline parts of divers kinds, is called serum. Thus serum is not in the blood but the blood swims in and is surrounded by serum.

200. *Being thus fabricated, the blood globules readily suffer themselves to be resolved and divided into their constituent parts; and they are, in fact, resolved at every circulation, especially in the brains, whither the better and softer blood flows. Hence it follows, that from the resolved globules and the affluent lymph, result the various kinds of humor enumerated above; in other words, that the true blood globule, divided into its elements, steals into and runs through the porous structure of the nerves by distinct paths; so that nothing of the genuine blood is lost, until it has performed its use in the inmost pentalia and medullæ of the whole animal kingdom.* On these points see above, Transaction II, n. 128-131; but that they may be more fully confirmed, I wish at this place to bring together the experience of Leeuwenhoek, as described by himself, who more than all other men has labored to open up the intricacies of the blood globule.

"I was able (he says) to distinguish in a butt\* various blood particles which had been disrupted; and in some I was able to distinctly discern four and five, and also in a few cases six particles. But what I thought worthy of note was the fact that many of these sanguineous particles which presented themselves to my sight, were of an oval figure, certain others were somewhat roundish, and others again were per-

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\*Butts are the fry of plaice and flounders.



fectly spherical. . . . I constructed a globule of this kind\* (he says) consisting of six globules, each of which were again made up of six globules, in order to set before my eyes the remarkable structure of these blood globules. I hold, therefore, that each single globule of our blood consists of at least thirty-six globules. When moved, and pressed, these globules, being flexible, are mutually pressed against each other, and take on a perfectly round shape.† But who shall say by what arrangement this is effected? For howsoever minute the parts into which, in imagination, we divide this globule of the blood, nevertheless the particles of which the globule consists may be infinitely smaller." [*Continuatio Arcanorum Naturæ*, Lugd. B., 1719, p. 217, 222.]

"I took a little oil of a yellow color, which had been expressed from the bark of the cinchona,‡ and afterwards mixed it with a little blood taken from my thumb, and, as quickly as possible, set the mixture for examination under the microscope; I immediately observed that some of the blood globules were coagulated and mutually agglutinated. Moreover, I saw, floating in this same humor or liquid, a large number of blood globules which were not only clear and pellucid beyond measure, but also, what is of more importance, in the case of each one of these globules I could most distinctly see that it consisted of other and diverse globules. These sanguineous globules presented a delightful appearance, especially when I set them moving before my sight, for not only could I distinctly behold the globules, but frequently I was able to note with the greatest accuracy, the juncture between

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\*Leeuwenhoek here refers to one of his figures which shows four globules in mutual juxtaposition, with a fifth resting on the four and over the space between them; a sixth globule is understood as being situated on the opposite side directly opposite the fifth. Each of the globules seen in this figure is marked by lines

to indicate that it also is made up of six globules, the sixth, of course, being again left to the imagination.

†Leeuwenhoek here gives a figure showing the six globules so compressed as to combine into a perfect globule or ball.

‡i. e., Peruvian bark.

the globules composing the blood globule; there somewhat of obscurity was seen, but the rounded eminences of each single globule again presented a clear light." [*Cont. Epistolarum*, Lugd. B., 1696, p 121.]

"I cut some pieces of the root of the yellow sarsaparilla into exceedingly minute bits, and pouring rain water over them I set them on the fire to boil. After the water had stood quiet for some little time, in order to allow of the little layers settling, I put a small drop of it, about as much as would cover the head of a pin, on well cleaned glasses; with this I mixed a drop of blood drawn from my finger by a needle-prick. I then saw that the globules which give the blood its redness were more scattered in the blood thus diluted, than I remember to have ever observed before. But what seemed to me most remarkable was the fact that a number of the globules were indented with a kind of a curve or sinus, just as if we should take a little vessel full of water and by putting the finger in the middle, produce a hollow cavity or trench. When those scattered globules, now of a flat shape (for when they lie sparsely scattered about, then, by reason of their exceeding softness, they assume a flat shape),—when these globules draw closer together, they sometimes assume an oval shape, in which case also those curves or sinuses spoken of above become somewhat lengthened out. But when, on the other hand, the globules are coagulated or stuck together they prefer the shape of a solid body, none of the parts of which can be distinguished by the sight. [*Epistolæ Physiologicæ*, Lugd. B., 1718, p. 420.]

"I found the blood of the spider to consist of plano-oval particles swimming in a clear liquor. Many of them had in the middle a shining oval lumen; others seemed as though they were made up of several roundish ovals of unequal size; others seemed to be almost entirely surrounded by minute globules; while others had no globules at all in their circumference, but had them in their middle." [*Arcana Naturæ*, Lugd. B., 1696, p. 54-55.]

"While I was observing the blood flowing out of the amputated legs of a spider, (after having for some time fixed my eyes intently on this blood, during which time a thin liquor



was being extracted therefrom), I saw saline particles coming from the blood, which particles, when gathered together, presented the appearance of twigs or branches. It was a by no means unpleasant sight to see these saline particles, many of which seemed to take their origin from one single point, as it were, that is, from one single sanguineous particle, frequently joining together and presenting an appearance like the branches of a rosebush. [*Cont. Arc. Nat.*, 1719, p. 330, 331.]

"I take it for granted that those perfect globules which impart the redness to our blood, are of such size that one hundred of them placed side by side in a straight line, would not equal the thickness of a little grain of sand; hence it follows that a million globules of the blood would equal one coarse grain of sand. I now observe blood-vessels in the brains, in respect to which I am positive that if one globule of the blood were divided into sixty-four parts not one of these parts would be able to traverse any of the little vessels; for if I put the diameter of these vessels as 1, and the axis of the blood globule as 4, then it would mean that even if a grain of sand were divided into sixty-four million parts still it could not enter the minute blood-vessels of the brain, especially if the minute particles of the blood were *not flexible* but rigid. I nevertheless think that this kind of minute blood particle always enjoys flexibility like those blood globules which have arrived at perfect maturity." [*Arc. Nat.*, Ludg. B., 1696, *De Structura Cerebri*, p. 35.]

In other places also Leeuwenhoek states on the ground of his experience that hard, compact and indissoluble blood presages death, but soft and soluble blood the finest health. [*Philosophical Transactions*, an. 1675, n. 117, p. 381.] He also affirms that he has seen with his own eyes a blood globule divided into lesser globules. These statements have also the consent of Boerhaave, *cf.* *Trans. I.*, No. 31. [See further citations from Leeuwenhoek, in n. 22-25, *sup.*] But let us continue the thread of our discourse.

**201.** *The next question is, WHAT IS THE NATURE OF THESE DIVERSE HUMORS? The inmost and genuine essence of the blood is the verimost animal, vital, and spirituous essence,*

which alone rules in the globule, and which acts therein from itself and its own nature. This principal substance of the kingdom courses through the simplest fibres, and the cortical substance continually pours into it a new substance conceived in its purest wombs and laboratories. This principal, and first, sole, inmost, supreme, most universal, most simple, and most perfect substance of the animal kingdom, comprehends in itself all that principle and nature which is found contained in the posterior and compound substances of the kingdom; and, therefore, to search into its character is to search from principles into the whole anatomy, pathology and physiology of the human body. This substance, or this truly animal essence, has been treated of in Transaction II., Ch. 3, [On the Human Soul, n. 208 seq.]; and that it is this which rules from principles in each blood globule see the same Transaction, n. 222, and other references there cited.

202. *The second or middle essence, that springing from the divided blood globule, is that essence which is called the animal spirit. It is made up of purest elements and principles subtly sulphureous, and ethereal, commingled with the genuine animal essence mentioned above; it is also the same as that essence which constitutes the pellucid globules of the divided blood. This fluid substance makes its way through the middle of the little sinus and minute chamber of each cortical gland, and courses through the little canal of each fibre. But with respect to the animal spirit, the reader will see a special transaction on this subject.\**

203. *That most chastened humor which runs through the interstices of the fibre, consists of those purest elements, subtly, sulphureous and ethereal, mentioned above, which result from the lesser and divided globules of the blood; on which is besprinkled a highly defecated lymph; in this way a highly pure serum is brought into existence, which serves for integrating the pellucid blood and perfecting its globules. The subtly sulphureous and ethereal elements are the simplest and primitive parts of salts floating about in the ether.*

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\*The little work on THE ANIMAL SPIRIT, published in POST-HUMOUS TACTS, is probably the Transaction referred to, or a first draft thereof.



204. *But the somewhat gross humor which is carried down in the interstices of the fascicles consists of urino-saline parts, from which oil and fat is made up, and of a lymph, collected under the arachnoid tunic, which is poured on. Thus is born the genuine serum of the blood, which serves for the construction of the red globules. The urino-saline parts are the secondary principles of salts, which are taken from the atmospheres and the aliments stored therein, and which come forth from the red blood globule when resolved. These are the parts mentioned by Leeuwenhoek, (n. 200 sup.), as breaking out in such abundance from the blood globule of a frog. Hence it is clear why we must be constantly nourished by aliments; that is to say, solely for the sake of the blood, to the end that it may come into existence, and that, whenever it is resolved, it shall again be made whole. The lymph is the vehicle that conveys, applies, and insinuates these aliments. From these considerations now follows the conclusion that all the humors that pass through the pores and lattice-works of the nerves come solely from the opening up of the blood; so that what runs through the porous and spongy structures of the nerves is the blood globule divided.*

205. *But for an intimate and minute knowledge of the nature of the several humors, it is necessary to open up the whole of natural chemistry even to its very principles. There we find only one thing that is universal, namely, that the primitive saline elements, or, what amounts to the same thing, the sulphureous and oily elements, are least and most perfect cubes, squares and triangles, the sides of which are hollowed out to suit the convexity of globules. Thus they are parts which, being angular, are themselves inert, and neither mobile nor flexible; and which serve active substances as an instrumental cause, and are most exactly accommodated to the nature, mode and form of all compositions. Respecting the generation, formation, derivation and figure of saline, sulphurous, and oily parts, see Transaction I., n. 69-79.*

206. *Then comes the question, BY WHAT FORCE ARE THESE DIVERSE HUMORS CARRIED DOWN THROUGH PASSAGES CONSTRUCTED FOR THEM IN THE NERVES? In the cortical substance, this*

*is effected by means of the expansion and constriction of the glands, that is, by means of the animation or alternate respiration of the cortical brain.* That it is the cortical and cineritious substance that is expanded and contracted, or that is the origin of the brain's animation, [is evident]; for each of its spherules is like a little heart prefixed to its fibre, not unlike the great heart of the body prefixed to its arteries. And since there are as many origins of motions as there are spherules of this substance, therefore, when these are expanded, the whole mass of the conglobated viscus, namely, its surface and blood-vessels and its universal medulla, is contracted, and vice versa; see Trans. II., 132-146. *In the medullary and nerve substance likewise; for each fibre, like an artery, drives its fluid into the parts that follow, and like the cortex, it has its alternations of expansion and constriction.* See above, n. 135, 146; and respecting the alternate respiration of the cerebrum, see Trans. II., n. 1 seq. [On the Motion of the Brain.] *This most pure humor between the fibres is urged to its outlets by the alternate expansion and constriction of the fibres; for it is not fluid of itself, and therefore is pushed forward by the highly active force of the fibre. For suppose we have smooth canals closely joined together, and between each canal an interstice; it would then follow that when the canals are expanded, the humor flowing without and between them will, by virtue of this expansion, be pushed forward. So also is it with the somewhat gross serum which flows between the fascicles of the fibres,—a serum which is as yet of a somewhat sluggish and inert nature, because impregnated with somewhat large and uneven particles. And, therefore, when the fibres remain inactive, and a rude and undigested humor stops up and obstructs the passages, there arises fat which interposes itself between the fascicles of the fibres.* That in fattened and sluggish animals the interstices of the fascicles are filled with fat, see figure 2, and Leeuwenhoek's description thereof. [n. 29.] That urinous and volatile salts give birth to such fat may be shown by many proofs, but here is not the place for making this excursion; it is apparent however, from the fact that when the blood is resolved by



chemical means it goes off into a thin and a somewhat gross oil, according to the experiment cited in Transaction I., n. 30, 34. *This is the efficient cause of the trajection and circulation of humors through the nerves; to which is added an auxiliary and promotive cause arising from the respiration of the lungs, which organs wonderfully concur in the transfusion of this juice through the nerves.* Confer Transaction I., Chapter I., [On the Composition and Essence of the Blood], and n. 172-176 above.

207. *Lastly, comes the question, FOR WHAT USE? The use is manifold, namely, that, at every circulation, the blood may be opened up to its very principles, and may as often return to its parent spirit and commence anew; to the end that it may be adapted to every use and formation, for the blood is the treasure-house and seminary of all the things in its body; that it may continually supply the spirit that animates the fibres and courses through them; that it may excite the motor forces and convey to the mind the modes, forces, and forms of sensations; likewise that the different kinds of juices, such as saliva, chyle, milk, bile, the genital essence, and many others may be rightly prepared in the glands. And, therefore, as soon as the blood is defiled with heterogeneous matters, and begins to grow hard, and no longer suffers itself to be unlocked in distinct manner, the universal animal economy labors, and from cacoehymia\* arise dire diseases of head and body, such as paralysis, atrophy, stupor, ataxia, phrensy, cephalalgia or headache, lipothymia,† fevers, inflammations, phthisis,‡ and so forth,—for there are a host of them.*

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\*An abundance of depraved humors in the blood.

†A sudden cutting off of the vital forces resulting in faintness, and, at the worst, in syncope.

‡Progressive emaciations; the word is generally used, however, as meaning *phthisis pulmonalis*, that is consumption.

## CHAPTER XI.

ON THE TUNICS AND LIGAMENTS OF THE NERVES,  
FASCICLES AND FIBRES.

208. *That each nerve is invested with its own tunic is evident, being recognized by the naked sight; but that each fascicle of fibres, that is, each nervule is also clothed with a membrane can hardly be detected without the aid of the microscope.* That the nerve is discriminated into principles or fascicles is not apparent to the naked eye, and still less apparent is the tunic of the fascicle; but that this fascicle like the nerve itself is also wrapped about, or tunicated, is declared by that keenest of observers, Leeuwenhoek, on the evidence of his own sight. His words are, "As I have often observed, each nervule is assigned its own separate place, and is covered about with its own little membrane, exactly as we have declared with respect to the fibrils of fishes and to the fleshy fibrils, namely, that they are all invested with their own little membranes" [n. 39]. And inasmuch as they are smooth cylinders and mutually separated from each other, and between them are interstices through which flows a humor, it necessarily follows that each one of them is covered over with its proper tunic; otherwise there would be no fascicle, nor nervules, nor principles of nerves.

(*To be continued.*)



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## THE FIBRE.

### CHAPTER XI. (*Continued.*)

209. *But that the fibre itself is girt about by a certain most delicate meninx is a fact which is not apparent even to the most highly armed sight, and which our imagination can hardly perceive. From analogy, however, it may be concluded that the fibre possesses a subtle membrane; for it is a little canal and transmits spirit, and it is distinguished from the neighboring fibres by a little triangular interstice through which flows a rectified humor. This purest little membrane of the fibre is also declared by our author Leeuwenhoek, to have been discovered to him by the microscope. He says, "The extremely minute vessels, of which, for the most part, the nerve is contextured, are also clothed with their own little tunics, not unlike the veins and arteries; but these little tunics are not conglutinated or coalescent with each other" [n. 39]. The same is also confirmed by Bartholin, who says: "The nerves, moreover, without exception, consist of many nervous fibres or filaments mutually held together by little membranes" [n. 13]. But as seen by the microscope, the membranes of the fibrils appear no otherwise than as a kind of slow and viscous humor; for they are most highly delicate, and, therefore, emulate the nature of a fluid rather than that of a solid. Such is the case with all substances in prior nature, which substances may yet be called inert when compared to the supreme fluidity of more active entities. Such substances, although they are fluid, yet, when gathered together and composing one larger body, appear as though consolidated and hard, because, taken together, they offer a strong resistance to the touch and to every assailing*

force. It is resistance that gives esse to the solid, the hard, the material, and the body, to which esse extension is thus necessarily adjoined. That this membrane is fluid is also testified to by Leeuwenhoek, who says, "Those fibrils, of which, as parts, the nerve is made up, are clothed with a certain mater for which I see no more suitable name than little membrane" [n. 33].

210. *But because this tunicle is the most simple of all the tunics of the body, it seems\* to consist of fibrils pure above every imagination.* If the fibre of which we are now treating be a little canal, and its circumambient membrane consist of the most delicate threads or shades of threads, it follows that these lines emulous of filaments are simple fibres,—fibres, namely, than which there is nothing more simple in the animal kingdom. But the simple fibre will come to be treated of separately in its own chapter. To the preceding may be added the remarks made in n. 190 above. *But we must proceed in order, treating first of the tunics of the nerve, then of the most delicate meninges or inner sheaths of the fibres, and, finally, of the ligaments.*

211. *The tunic of the nerves, as is obvious to the naked eye and to the touch, is double or triple; for the outmost tunic may be easily separated from its trunk, but not the inmost, which is closely adherent. This tunic of the nerve is the dura mater itself, which is superinduced when the nerve, in the course of its exit from the brain, perforates the cranium, or when it breaks out from the dorsal spine through the spaces between the joints of the vertebræ. This dura mater consists of two or three layers, which distinctly separate from each other when the mater invests the nerve, and also when it invests any of those sinuses which are called sinuses of the dura mater. That the dura mater is a double or triple membrane is recognizable by the touch of the fingers; for if it be rubbed between the fingers in contrary directions, it is evident to the*

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\*It may be remarked that the word *videtur* translated *it seems*, does not necessarily imply the doubt suggested by the English words; it might equally well be translated *it is seen*.



feel that the one layer as it were recedes from the other. This is still more clearly evidenced in the sinuses which are invested by the inner membrane and covered over by the outer. The same is also confirmed by the directions of the fibres of the dura mater, in that they do not run out in a like direction and order. Convinced by these circumstances, investigators assert that this mater is a double membrane and some that it is even triple. That it is triple is not very far from the truth; for there is an intermediate layer which is vascular, since arteries flow between the two layers and join them together. Perhaps also this arrangement still persists in the ramifications of the dura mater. These layers of the dura mater are not easily separated from each other, except in those places where necessity itself has laid down the law; as, for instance, where the dura mater encloses the sinuses, and where it wraps itself about the nerves; in the latter, when unbundled, this is quite apparent, the outmost tunic being torn off or coming off almost spontaneously, but not the inmost.

**212.** *But this tunic does not remain the same throughout the whole extension of the nerve in the body, as it was in its origin, but is changed and reformed.* These points will be dealt with in the next chapter. A nerve's quality which shall be adequate to its functions in its extremities, depends not only on the enclosed fibres and their nature, diversity, position and quantity, but also on the investing tunic; for it is this latter which tempers the forces of the fibres, that is to say, which tempers the degree of these forces. The cause of the quality must, indeed, be derived from the brain, whence is the beginning of the fibres and nerves, but it comes also from the body; for principles and causes regard effects as though these were present in themselves, and were of a quality corresponding to themselves; thus the means, that is to say, the nerves, are formed after the manner of the extremes. The quality of a nerve is therefore varied according to the use which the nerve performs in its extremity. Hence it follows that one nerve is never entirely like another. *And this, according to every use in the extremes; and it becomes either a nervous, a muscular, or a tendinous tunic; that is to say, it becomes more or less active or passive.*

213. *But to resume. For the weaving of the tunic of an entire nerve every kind of vessel and every kind of fibre is used.* Boerhaave is also of this sentiment; see what he says, n. 46, above. For there are little vessels, especially of the cerebrum where they are called the arterial vessels of the dura mater, which accompany the outgoing nerve, see above, n. 105; moreover, in the body also many vessels insinuate themselves. There are also the vessels of a middle nature, that is, vessels emulous of the fibre. Moreover, genuine fibres insinuate themselves into the tunics, and this especially in the ganglia, where they make a kind of turn, and where the old membrane, that is, the membrane of the brain, is put off and a new one put on, as will be shown in the following chapter. Moreover, all this is necessary to the nerve, which rouses up everything in the body; and, therefore, for the building up and maintenance of the nerve everything prior and everything posterior must concur, in order that the nerve may act as the middle cause.

214. *And thus the nerve, before it emerges from the soft brain where it acts in the greatest freedom, is guarded by a sufficiently strong covering and defended by a breastplate; and this to the end that, when it lets itself into the field of motions and effects, that is to say, into the body, where reign inequalities, mutabilities, disturbances and discords, it may be immune from every danger.* In the brain all things are tranquil, and as though in their birth, for there rule principles, forces, and causes; but in the body are the ultimate effects and motions of the causes, that is to say, a more imperfect nature, see Transaction I., n. 615; and, therefore, also the two kingdoms, that of the brain and that of the body, are held most distinct from each other.

215. *The tunic of the fascicles, which is not so obvious to the senses, is likewise double,—I dare not say triple. This follows as a consequence from the analogy of its compounds, for as is the case of a nerve in respect to its nervule, so here is the case of the nervule in respect to its fibre, which is a most simple nervule. The like also obtains in the cerebrum, cerebellum, medulla oblongata, and medulla spinalis; moreover in*



*the muscles and glands, and also everywhere else in the body. For such as nature is in the greatest things and those obvious to the sense, such also she is in the lesser, yea in the least; and thus, such also in the fascicles, yea, in the fibres,—with a difference solely of degrees; and this rule so far holds good in superior things, that these must be extricated, explained and understood by means of analogies.* Confer Trans. I., n. 629-632. The recognition of the tunic of the fascicles as being a double tunic is not opposed by the delicacy of this tunic, nor by its degree of consistency so nearly approximating to fluidity; for substances, compounds, and series of purer nature know not what the hard and the solid is, as these come to our apprehension by contact with the senses. Moreover, they may be fluent, and yet, among themselves, have concordance and consistency, for they are placed beyond every fear of lesion, and every chance of danger; that is to say, they are set, as it were, in the state of their integrity, and in a state which is free for action and for passion.\* For compound substances, which in themselves are mutable and of themselves uneven, nor ever consistent with each other, cannot act upon the more simple substances of which themselves are the compounds; this would be contrary to nature, to every physical law, and to the decrees of philosophy. But it is the simple substance, that is, a substance that is more simple than its compound, which acts into its compound. This is most evidently apparent in the first formation of the chick and the embryo; see Transaction I., n. 248. It is also apparent in the vesicles [of the primitive brain of the chick and embryo]; for though these vesicles are most highly fluid, nevertheless, through them, paths are laid down with the utmost distinctness, whereby the spirit flows most distinctly to its goals and its appointed ends; confer Transaction I., n. 313. These facts, however, do not prove that the tunics of the fascicles are double, but only that they may be double; still the similarity of the case in the glands, muscles, and other membranes of the body would seem to lessen the doubt though it does not remove it.

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\*i. e., for suffering action.

216. That the tunic of the fascicles is double, is declared from its first cradles; for as soon as the fibre is born from the cortex it joins itself with its companion fibres, near by or far off, which are of the same office, and, then, like fascicles, they at once enter under a loose tunic, that is to say, a fascia and close web contextured of vascular offshoots. This fascicle, discriminated into plexuses, is then continued through the whole medullary portion of the brain all the way to its boundary or meningeal surface; from this is drawn the first or inmost tunic which surrounds the fascicles and at the same time gathers together the scattered fibres. But when the fascicle thus introduced to its inmost or proximate tunic breaks out from the medullary stem of its brain, it covers and girds itself with the pia mater, and thus puts on a new and second tunic. That the new-born fibres flow into a sheath compaginated of vascular offshoots, and this at a distance of hardly a few lines from their origin, see merely the plates of Bidloo, and Verheyen.\* That the little vessels of the brain form tunics around the fascicles and plexuses of the fibres which constitute the medullary† brain, confer n. 128, 129, 196. From these and other considerations it may be concluded that there is nothing in brain and body which is not tunicated, that is to say, distinguished from its neighbors by tunics. Moreover, that the medullary fascicles before breaking through the pia mater and girding themselves with a second covering therefrom, are beset round about with a kind of tunicle, is apparent in the cauda equina, which is the last portion of the medulla spinalis; for the whole of this cauda is made up of fascicles and nervules. These fascicles, even before they have reached the pia

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\*Bidloo's plate is a view of a section of the cortex of the brain seen under the microscope. It shows a large number of cortical glands; below the mass of these glands a number of delicate lines representing fibres, are shown, which almost immediately come together to form about five or six

fascicles or nerves. (*Anat. Hum. Corp. Amster.* 1685, plate x, fig. 2. The same figure is also shown in Cowper's plates.) Verheyen's figure is like Bidloo's—though smaller. (*Corp. Hum. Anat. Amster.* 1731, tab. 34, fig. 6.)

†The Latin here is *corticale* (cortical).



mater, are nevertheless covered with a tunic which they must have received from the medulla itself. These proofs make it manifest that the fascicles also are involved in a double tunic.

217. *This pia mater is not a single membrane but a double, and, if we add the arachnoid, a triple. Hence it follows that the membrane which surrounds the nervules or fascicles, now become the beginnings of the nerves, is at least threefold.* That the pia mater is double, is asserted by some of the keenest investigators as a result of their experience; at any rate from its inner surface are put forth an infinite number of shoots, like fibrils, while its outer surface remains intact. Its inner surface, therefore, is rough and appears to be beset with some mucous fluid, while its outer surface is smooth and even. This argues that there is some duplicature. The same conclusion may be made from the arterial vessels which mark its outer surface. With respect to the arachnoid tunic, no doubt can be entertained but that it is extended through the whole of the pia meninx; but as to the mode in which this tunic also involves the fascicles,—this will be seen below.

218. *From the above it is apparent that the nerves are productions and continuations of the brain; for they carry with them not only its fibres and vessels, that is to say, the medulla, but also the meninges themselves; and, moreover, all those spirits that have their origin in the cortical substance; and also all other humors secreted by the cortex, and which work their way through the sieves of the medullary substance and are derived into the nerves.* The vessels, as being more inert and reactive than the fibres, betake themselves to the surface, while the fibres, being active, betake themselves towards the axis, and to the centres. The humors springing from this living fountain, that is to say, from the brain, are derived into the interstices of the nerves. Thus the whole brain is present in the body, but like the nerves, it is there parted and distinct, in exact ratio to the effects at the extremes.

219. *The finest membrane, meninx or tender bark which invests the single fibres, that is, which constitutes the channellet itself, seems also to be a twinned membrane if not a triple; for the inmost tunic of the fascicles puts forth shoots which enter*

into the single fibres and bind them together. The same conclusion is also deducible from its first origin; for the fibre arises from its cortical gland from which it is drawn out by continuity, and that this gland is girt about by a most delicate and soft meninx, is confirmed, albeit obscurely, by experience. Moreover, each cortical spherule, is, in least effigy, a gland, heart, brain, muscle; that is to say, is everything which performs any manner of office in the body. See Transaction II., n. 176-202, and also n. 144 above. This mater of utmost softness, cannot but be produced into the fibre which is a continuation of its cortex. See Transaction II., n. III, seq. But the finely subtle fibrous substance which forms the body of that gland, and which likewise is drawn around the fibre by continuity, is its inmost membrane and lies under the former. Such an effect is an inevitable consequence of the connection and origin of the fibres from their cortical glands; for there is no room for doubting, still less for denying the fact that these glands are corpuscles of a spherical form, approaching to the oval, and that a corpuscle of this kind is contextured of the most delicate threads, which constitute its subtly medullary substance. A fabric or minute medulla of such nature must by all means be terminated in some surface covered over with the softest meninx, wherein, namely, it places its limits, and whither it extends the sphere of its forces. Add to this, that, if the fibre be the continuation and elongated appendix of its cortex, then this most pure fibrillar or medullary substance, together with its softest meninx, must be carried over into the fibre. From the genesis of the fibre thus confirmed, it follows, that the fibre also is furnished with a double tunic.

220. Thus the mode in which the nerves are tunicated, that is, are limited by tunics, is apparent; for it is fibres that constitute the medullary substance of each nerve, and vessels, or arterial and venous terminations, that constitute their tunics. See above, n. 144, 165, 166. The fibres are most highly active since they are the forces of the brain and body; while the vessels whereof the tunics are made up, are passive, and relatively, are inert forces. See above, n. 138, 139, 140, 164. Thus to the nerves are given forces of a diverse disposition, to the end that



*there may be those that act and those that react, that is to say, that temper, limit and restrain the activities of the fibres; and this in such order that the impulses from the centres to the surfaces may decrease by their degrees. Such is the sphere and limitation of the activity of fibres, fascicles and nerves.* To the above it may be added, that the vessels of the brain, which, relatively to the fibres, are passive, or, what amounts to the same thing, reactive, become still more inert as they progress, so that in their ultimate ramifications they lose almost the whole of their reactive nature. For the origin of their motion is in the brain, and depends on the general animation of the cortex; therefore they go off into stems that are entirely dead and are gifted with no power of reaction; for nothing of the vital juice flows into them from any fountain, as into the genuine fibres, and the only thing that produces fluidity is that vital essence which is conceived in the cortical glands and is continually excluded by them. In order that nature may supply this defect new vessels enter into these tunics in the body, and also into the nerves.

221. *There are ligaments which connect the several fascicles to each other, and the several nerves to each other, and also the nerves with the fascicles and the fascicles with the fibres, and bind them together to act as one. These ligaments, bonds or fetters, untied and plucked, as it were, from the inner layer of the tunic of some nerve, penetrate towards the interiors of the nerve and flow into the outmost tunic of an enclosed fascicle; and on the way they so ramify, that they bind the several fascicles together. So likewise there are ligaments extending from the inner tunic of the fascicle to the outmost tunic of some fibre,—the case being not unlike what is seen in the brains, tendons and muscles. Authors make mention of having frequently observed this phenomenon in the nerves, and it is visible also in other compositions.*

222. *These ligaments in the nerves are not continuous webs or membranes; but they are discreted propagations and offshoots which form septa and cellules between the fascicles and between the fibres,—and this with such contrivance and direction that the humor circulates freely around every fascicle, and*

*around every fibre, solicitously guarding against their growing together, and enabling them to keep their natural state and mutual situation and to be brought back thereto as often as any change is induced upon them.* That this is what obtains in the tendons, has been set forth by Leeuwenhoek who has observed it: "I recently found (says he), that not only are tendons invested by a strong membrane, but that this membrane gives rise to little branches, and that these, luxuriating into new branches, form septa which again are dispersed into lesser tendons." (n. 41; see especially fig 16. That a large quantity of fat was found between the fascicles of the nerve, see fig. 2, and n. 206; that this fat is held in the cellules, is well known. The same is confirmed *a priori* or from principles. For unless the humor permeating the interstices of the nerves were frequently intercepted, it would be expelled out of doors and be dissipated at the first expansion of the fibre or fascicle, and thus would not be determined to the use intended by the brain in the fibre; thus, with the flying away of the interstitial fluid the state of the fibre or fascicle would fail to be restored, and fibre would coalesce with fibre and fascicle with fascicle. Therefore, care seems to be taken that this circumfluent humor, which likewise is reactive, and, relatively to the animal spirit enclosed in the fibre, is passive, shall press upon every point of the convex surface, just as the enclosed humor presses upon every point of the concave surface. We can make a rough experiment of this if we try to break a nerve by pulling it lengthwise or in the direction of the flow of its fascicles; the ligaments then cause a certain delay in the breakage, a number of them unfolding from the inner parts of the cord; and this cohesion is sufficient argument for the colligations spoken of above.

**223.** *For fibres, which are the active forces of the brain and body, are continually endeavoring to induce change, but are as often restrained by circumfluent juices and tunics, lest they carry themselves beyond limits and the sphere of limits. According to the general rule that every active force tends to a change of its own state, that is, of the state of the substance wherein it is; nay, it would produce such change were it not restrained by the contiguous parts. Hence is deduced the cause*



of all equilibrium in the things of nature, and of the loss thereof.

224. *From the duplicatures of the tunics we can also gather, that some lymph of an oily nature, or some subtle moisture flows between them, which anoints the points of juncture, and guards against their coalition. Thus, in a cross-section of the nerves, there are seen other little passages and open commissures, not hitherto mentioned. Therefore it is clearly evident that in the nerves there is nothing that is not transpirable and perspirable. According to the teaching of Hippocrates.*

225. *When these bonds are too greatly constricted, fibre coalesces with fibre and fascicle with fascicle, and the tunics stand open. For since the inner tunic of the nerve is colligated to the outer tunic of the fascicle, therefore, when the copulas or bonds between them become constricted the duplicatures necessarily open out and amplify; for the bonds bring the tunic of the fascicle nearer to the tunic of the nerve. Thus the permeability is lost, and the nerve refuses to admit the juice of its brain. Hence comes lack of response, impotence of action and sensation, rigidity, fragility, old age, and finally death. Thus according as the structure of the nerves is more agreeable to the laws of nature, so it is the more transpirable, and also perspirable, the more potent of action, and the more youthful and vivacious.*

226. *On the other hand, when the bonds are too greatly relaxed, or are ruptured, they betake themselves back to their tunics, and then fibre is disjoined from fibre and fascicle from fascicle, and the tunics are agglutinated together; hence an abundance of unordered humor flows in and stops up the interstices with serums, phlegms and fat; whence come various kinds of diseases both of the head and of the body. Of these we shall speak below.*

227. *For the interposed ligaments together with the tunics and their duplicatures enable each fibre and each fascicle of fibres to enjoy its own proper sphere of activity, within which it acts in the greatest freedom, though under the restriction of the law that, while it breathes its own good, it must also breathe*

*the good of the community.* That the fibre can act by itself, and the fascicle by itself, is a consequence following from the mechanism of the duplicature of the tunics, that is to say, from the fact that the outmost tunic of the fibre is connected with the inmost tunic of the fascicle, and the outmost of the fascicle with the inmost of the nerve. The effect of the space between the tunics is, that they do not depend on the neighboring parts except so far as a similar and thus a common action is enjoined on them both by the brain. But because the outer tunic can recede from the inner no farther than is permitted by the neighboring parts, and, it may be, by the tiny ligating cords which pass between them, so each fibre, or each fascicle, must stand for the common good while it is standing for itself or for its own good. For the most perfect life consists in this,—that all the parts live a common life, but, at the same time, that all the least individuals, each furnished with its own force of action, conspire to unanimity; and therefore over them all stands one queen,—the soul. *Thus here, as in all other places in the animal kingdom, is represented the entire form and state of a society and republic. For when these bonds are loosened the communion is destroyed, and lost, and each fibre works its own cause, and each fascicle its; and then the brothers, disjoined from each other, easily become discordant, yea, and rebellious; hence the State is overthrown, and the Kingdom dissolved. This is the sole cause of old age and of death, after the Fall. For as often as the pleasures of the body and the affections of the animus make war with the desires of the ends of the mind, so often are the beginnings of the fibres, which lie in the brains, made to suffer, and the ligatures everywhere either relaxed or constricted; and immediately too much or too little of humor is transmitted; the animal spirit also and the blood are disturbed, and admit unsuitable elements whereby they are defiled. Thus it is nothing else than the intrinsic discord between the forces and the subject parts in ourselves that hastens our years into old age, and this into death,—just as in societies, kingdoms and great empires.*

(To be continued.)



## TOUCH, OR THE CUTICULAR SENSE.

TRANSLATED BY E. S. PRICE, A. M.

1. *Experience*; see the authorities; there are: 1. The epidermis with its scales, 2. the corpus reticulare of Malpighi, 3. the papillary membrane, with interwoven vessels and filaments, properly belonging to the cutis, 4. the subcutaneous and miliary glands, 5. the layer of subcutaneous nerves, 6. in brutes, the muscular layer, 7. the adipose membrane—otherwise called the periosteum.

## ANALYSIS.

2. The body of an animal is a world by itself within the greater world, or it is a substance which acts by itself, and an Essence or form, which communicates with the greater or greatest, by which form it subsists: and it is held in its form, compositely and particularly; while yet it enjoys its own powers, such as the universe enjoys, from which it rules itself in the greater: therefore we ought to see how the animal world acts by itself; it communicates with the greatest world, it inflows, and the reverse; what is the nature of the dependence, and how it is left to itself, to its own power; and how, according to the ancients, it actuates the microcosm.

3. *The circumfluent atmospheres enjoy their own characteristics, powers, forces, modes and forms*: as to the first air, its characteristics are as follows: 1. to press upon things in the way, on all sides equally, according to the altitude of the column; 2. to flow in volume from place to place, and thus to be determined by its own causes, 3. diversely to vary its nature, and to be affected, that is to say, now to be expanded, now contracted; to tremble and to come to rest, to grow hot and to grow cold, and many more, whence are its many affections; 4. to be modified according to the nature of its parts, and indeed from afar; 5. then also to be impregnated with many other things, such as effluvia. 6. It is similar

in respect to the higher atmospheres, but since they are prior and simpler they each exercise those more perfect natures, which have been mentioned.

4. *All those atmospheres act upon the animal microcosm.* 1. The air by its pressure acts upon its whole circumference and surface, which it therefore holds in its own connection and form, 2. by its force of flowing into the lungs, 3. by its affections also upon the surface itself, such as growing hot and growing cold, whence partly is the sense of touch; 4. to be modified, whence is the sense of hearing, which applies the nature of the modification to itself; 5. to be moved by effluvia, whence is the sense of smell. 6. Hence the animal microcosm applies to itself all the characteristics and powers which the air possesses, and yet those characteristics and powers do not operate except upon the surface, nor is it admitted that they shall act inwardly; for it (the air) is immediately expelled, for, for it to act inwardly would be the act of a hostile enemy.

6. *The air receives and draws down rains;* it throws them out in a shower;—the remaining atmospheres act similarly, for, 1. they press upon the more minute parts, 2. perchance also they flow into those parts as into their own lungs; 3. by their variations of state they affect those parts, as is evident from many experiments; 4. they present modifications, as by sight to the eye, even from the sun and stars. 5. They receive the effluvia of those parts by means of sense when that is arranged for reception, as in brutes, 6. or by means of sympathy, and many other things.

5. *As the atmospheres act upon the animal microcosm, so supreme celestial forms act upon the soul,* 1. not only celestial forms of which the soul is a part, 2. but also, spiritual forms, 3. in which our soul is and lives; 4. the soul is not only actuated and moved, 5. but also affected, 6. and, moreover, modified. 7. By means of correspondence and analogy, we can learn from the one about the other, although it transcends the sphere of common understanding; 8. thus we may treat of the body of such things from the universe, its atmospheres and auras, lastly from spiritual things.



6. *The animal body has been furnished with similar powers*; for it has its own determinations, into which it is excited, as well by an external way as by its own proper forces and powers. 1. It presses upon its own parts according to every adapted form of determination. 2. Its parts flow, whence is pulmonary motion and the circulation of its blood and humors. 3. It is modified by its own causes, whence there is given to it the liberty of thinking, willing and acting. 4. It is also similarly affected by itself. 5. It conveys its parts, which it surrounds.

7. From the above it appears, 1. *what is the nature of the influx of the macrocosm into the microcosm*; 2. what is the nature of the communication of the operations; 3. what is the nature of the correspondence. 4. But lest I should go off into the arcane, let us now stick to the question of the influx of the air into the cuticle, which is the object of our lucubrations.

8. *The cuticle itself is the limit between the body with its ultimate compages, and the grossest atmosphere with its ultimate compages, wherefore between the body and the world*. 1. In this limit we can learn how the air flows into this its own world; 3. how the microcosm flows back into the atmospheric world; 4. what is the nature of the communication of each one; 5. for all of it has been impressed upon the cuticles; wherefore such wonderful things occur.

9. Let a comparison be made, in order that we may take note of the influxes. 1. The microcosm is defended and held apart from the atmosphere by the Epidermis, or squamous cuticle, lest it suffer injury. 2. It is held in its own form by that atmosphere which presses it above equally. 3. It likewise presses back and holds itself in equilibrium against that force and gravity, and this indeed by its own atmospheres and vapors which fill up its cavities. 4. Thence is the balance of action and reaction; 5. nor could the one subsist without the other, that is, the microcosm could not subsist without the macrocosm; but the air is not admitted, because it is an attacking enemy. 6. In order that the cuticle may sensate the af-

fections of that atmosphere, it enjoys the sense of touch, whence is the papilliform membrane, which lies beneath; 7. and in order that it may sensate according to every affection of itself, the retiform tunic regularly intercedes, which regulates the organs of sensation, that they may all rightly obey; 8. in order that it may receive those things which flow to it from the atmosphere, it is supplied with the glandular cutis or tunic. 9. Thus the ultimate or squamous tunic is for protection. 10. The second or reticular tunic is for the regulation of sensation and of the effluvia. 11. The third tunic is for sensation. 12. The fourth tunic is for the communication of the parts. 13. The microcosm is in all things similar to the macrocosm, it likewise also attracts effluvia, moistures, and many other things, and likewise disperses them; it is affected in like manner. 14. Thus from the atmospheres we shall learn the nature of the microcosm.

10. But the animal microcosm has been so constructed, 1. that it may appropriate to itself all things which happen from without, 2. that it may refer all that it receives to its own internal, 3. that from internals it may communicate them with its superior and supreme parts. 4. From the supreme it proceeds to ultimates, 5. the former by sensations, the latter by actions. 6. Thus in order that we may be the hosts of the supreme mind. 7. By this way especially supreme things descend to ultimates, and from ultimates ascend to primes. 8. Indeed as the universe is ruled by its own supreme, and by the Divinity, so also is the animal microcosm to be protected by, as it were, its own divinity, that is, the soul. 9. But yet in such a way that this soul shall depend upon its own supreme. 10. Thus we see how wonderfully all things conform themselves.

#### THE CUTICLES IN PARTICULAR.

11. *The Epidermis or squamous tunic:* its uses are, 1. that it may protect the papillæ from injury from the air, 2. also from injury from heat and cold; 3. that it may apply itself to the organic papillæ, so that thence may arise a general sense; 4. so that the tremiscences arising from the papillæ may be exalted, thus the sense elevated, that is, the



sensation, according to the modification. 5. All things are arranged and formed according to uses; 6. so that the squamous tunic furnishes a passage for the perspiratory and evaporatory pores, etc.

*Its use in respect to the air is to protect the sensories against injury from the air.* 1. It has respect to the air, for it touches it, and is an ultimate boundary. 2. There are fluent particles, variously figured in the atmosphere, from all the kingdoms [of nature], which must not immediately touch and pierce; 3. the affections and changes of the air must not immediately impinge upon the sensories. 4. If this should happen, the sensories would become dull, or would sensate too acutely. 5. It likewise protects against other injuries, as those of the ether and its affection, against accidents from those things which slip in, and which fly about in the air, as, for instance, insects; 6. against accidents and manifold injuries from other microcosmic matters. 7. Wherefore the scales of the epidermis are of an almost general character; they are somewhat hard, they are lamellated in accordance with this whole use.

*In order that the uses may apply themselves to the organic papillæ, so that a general sense may be produced,* 1. that is to say, according to all those affections and changes of state, 2. the tunics continually expand and contract. 3. Into these they also pour out tremiscences that the sense may be heightened; 4. for this reason they are pliable and divisible, 5. and arranged entirely according to the quality of the state; 6. they are everywhere different; 7. they differ according to age, labors, culture; in infancy they are membranous. 8. They are formed according to every action and extension of the papillæ; these effect changes of state, since they are so divisible, and are such as are the forms. 9. Almost the same as, from a similar usage, is the case in the tongue. 10. They are everywhere differently arranged, in exact ratio to the sensation, usage and culture, to place, to heat, in a word, to sense.

*In order that the tremiscences may be elevated to the sense through tremiscences;* 1. as elsewhere, where there are periosteal and cartilages the sense is keener. 2. Wherever

there is sense there are hard bodies, corresponding thereto; so in the tongue, the nostrils, in hearing, in the eye. 3. A suitable tremor seizes them, wherefore it is elastic and vibratile. 4. But these tremiscences are at the place of entrance. 5. They are united with the papillæ by the reticular membrane, upon which they depend and to which they are bound, and thus upon the papillæ which are interwoven in the net of that tunic; wherefore it is effected mediately.

*In order that they may furnish a way for the perspiratory pores,* for 1. they furnish a way for the sudorific pores. 2. They are themselves perforated with innumerable pores according to Leeuwenhock. 3. They can be spread open and drawn together. 4. So this tunic furnishes a passage for the gifts of the air, and the effluvia of the body.

*It is for this end that these things are thus organically formed:* 1. for they are all for the sake of use, 2. so that they may accommodate themselves to the air and to their own body, and to all the tunics. 3. It is varied according to every use. 4. They vary according to every temperament. 5. They vary according to ages. 6. They are applied precisely; they are thinner, coarser, harder, softer; they are conglutinated, they are simple, they are more or less elastic to repel injuries; they are accommodated, pensile, retractile, slipping back into their own form; they are pendulous, in order that they may yield inwardly; the sudorific pores are adaptable; they are variously pierced. 7. They appear to be derived from the covering of the filaments of the reticular tunic, which covering is continued, as it were, a subtile periosteum, upon which they also depend. 8. Thus they appear to consist of continuous filaments, through which flows a humor; of which the more fluid part is evaporated. 9. Through its pores themselves there is perchance given a perspiratory way for most subtile exhalations; from the body, wherefore they are pierced. 10. This is more plainly evident from the skins of crustaceans, insects, and many other animals, where this tunic comes to an end in a rather hard shell, and is like bark.

12. *The uses of the reticular tunic are,* 1. that the



squamous tunic or epidermis may rightly rest upon it, 2. that the papillæ may be regulated according to sense, affection and change of state, also as to situation, connection, motion and effect; 3. that the undulatory tremor may be spread round about upon the surface, and may return into what is general; 4. that it may carry the sense off into the scales of the epidermis; 5. that it may also regulate the sudorific pores, and many other things which are within; 6. for the use of the interior tunic is then for the exterior, and for the whole interior; thence is its state.

*That the scales may rightly rest upon it,* 1. for that tunic passes over into the scales by thin periosteæ. 2. Thus can the epidermis arise, be supported and vibrated. 3. Those reticular filaments are the bases of the scales.

*That the papillæ may be regulated according to sense,* 1. as to situation, 2. as to connection, 3. as to motion. 4. By the reticular tunic communication is given with the epidermis; 5. by it the tremor passes over into the scales and back again; 6. otherwise the scales would be something not in order. 7. Thus the sense passes over from the finest to the coarsest things, and a tremulation arises, wherefore an exaltation even to sensation, and a repercussion even into the nerves, when they slip back. 8. There is everywhere a hard body.

*That the tremor may return into what is general,* 1. along the filaments of that tunic, and into the scales of the epidermis; 2. there is a connection of it with the papillæ, and with the scales; wherefore it performs a use to each and is a medium. 3. The tremulation of the epidermis is also reciprocally extended. 4. Thus is effected a communication of the whole cutis.

*In order that it may also regulate the other pores,* that is, the sudorific, 1. they also pierce that tunic, 2. both the excretory and the inspiratory vessels, 3. and in hairs, thus it performs a use to the adipose tunic.

From the use is known whence is its state. 1. It is black in Moors, white in Europeans, whiter still in the northern races.

2. That is to say, it is evidently for this use, namely, that

the solar rays, penetrating the epidermis in a very lively manner, may not injure the sensories; they beat back that penetration, they dull it; they entirely change the state of those pores. 3. For blackness absorbs the rays, whiteness repels them. 4. Thus excessive heat or radiance does not hurt the papillæ in Moors, and excessive cold and the more oblique rays of the sun does not dull the papillary sensory in Europeans. 5. There is an equilibrium of all things, which returns thither, lest too much or too little hurt the sensory; thence is color which is thus put on by nature, and all things adapt themselves to it; whence is black hair, kinked hair, the salacious temperament, and similar blood. 6. This equilibrium can be subjected to calculation. 7. There are filaments, not regular forms, but unequal interstices, among which the tunic winds about. 8. Similarly also among those parts, as in the retina of the eye. 9. The adaption of the retinæ of that tunic is according to external uses. 10. The like is observed in the tongue, which approaches very nearly to this sense, but is softer. 11. *Thus it distinguishes general sensations into parts.*

13. *As regards the papillæ or little sensories, the following is a description:* They are soft, sensitive, expandible, retractile organic substance; they are mammiliform, papillary, sensitive, organic, by reason of their contiguity appearing to be continuous, variously winding and gyrating, in discriminating furrows, spirally, circularly, crookedly, lineally, diversely; it is here denser, there rarer; here harder, there softer; at particular points of its whole circuit; thus in one manner on the breast, another in the hypogastric region, another on the back, another on the arms, another on the palms of the hands, another on the soles of the feet, another on the fingers, another on the glans penis, another on the scrotum, another on the vulva, on the cheeks, on the lobe of the ear, on the lips, indeed within the mouth, the throat, the gullet, especially in the tongue, where a similar distinct organism is represented, and such as may be demonstrated; that congeries is pierced by infinite pores, as it were, points, discovered, described and drawn by Leeuwenhock and others; thence is the



subtile Sanctorian perspiration, the vesicles in the whole cuticular circuit number 2,016,000,000. This papilliform substance under the epidermis now reaches outward among the reticular spaces of the interjected membrane, now withdraws inward, and spreads itself, points itself, crinkles, becomes distinct or united, according to the power of the contact, to its qualities, to the intentions of the animus, to the desires of the mind, to many affections, to the requirement of nature. The thinner and finer the epidermis, the better and more distinct is the sense; on the contrary, it is duller and more general, the harder the superimposed scales, the more extended, the more duplicated. It passes over and offers [itself] to the excretory vessels, as also to the hairs between the furrows and divisions just now mentioned as circular and curvilinear, where it is wet with a kind of unctuous and besmearing fluid.

*The order of things to be observed. 1. Preface. 2. Description, where many things are inserted which may concern the tissue and its uses. 3. The uses are reviewed. 4. Particular uses are expanded, together with the tissue. 5. The several points are confirmed in notes by experience and comment.*

14. *The uses of the sense of touch are, 1. that they may announce to the soul what flows to and touches from the contiguous outer world; then also what flows to and touches from remaining objects, that is to say, what infests that whole kingdom, whether it be from the world or from allied subjects, or from itself, in case of sickness, why they are, what they do as guards and intercommunicants. 2. In order that the soul may learn the affections of the aerial atmosphere, and perhaps also of the etherial, and in order that it may be changed as to state according to those affections; 3. in order that the cutis and the whole surface may undergo changes of state, according to all the affections of the body, of its blood, of the animus and its spirit, of the mind and the soul; 4. and may thus arrange communications, especially of the parts which are insinuated from the air, or are expired into the air, according to every need, state and necessity, which*

are the necessary media for the conservation and restitution of the microcosm; and which are hidden within. 5. They are qualified for these uses.

15. *In order that they may announce to the soul what flows to and attacks from the contiguous world and other objects.* 1. The sense is very gross and is a sense only of greater compounds and of ultimate effects, for they are in the ultimates of the kingdom, where it touches the circumfluent world. 2. Wherefore only a congeries of parts sensates; the organ which sensates parts is that of taste, and the organ which sensates parts of parts is that of smell. 3. Things which are similar coincide with these things in the organs, but they differ in compounds, for while a composition is touched, it is a composition of parts which is sensated, when a smaller part or the part itself is touched, the papillæ are too few. 4. In order that there may be a general sensation, the scales of the epidermis confer; the larger, coarser, less elastic, and the more of them, that are touched at the same time, the grosser is the sense. 5. Because the senses of taste and smell are assimilated; the papillæ are similar and can be sharpened according to mode of culture, and according to need, as, for instance, if they be laid bare, the scales grow tender, they may be more distinctly disposed; the papillæ themselves are rendered sparser, and ordered in a more suitable form; 6. for they are arranged in a more suitable form, that one papillæ may be conscious of the touch and mode of another, and all together, from a particular form and the general [effect] of many things, they have this, that in whatever place sense exists, they sensate more exquisitely and distinctly. 7. Wherefore one papilla is never like another, nor is the form of many in one place similar to that in another. 8. By means of this sense the soul knows what is being done in the ultimates, that by means of the other senses it may know, shun and arrange for shunning that thing. 9. Those fibres go off into organic forms, in order that it may receive every contact exquisitely, especially into the common form, wherefore the parts or papillæ are distinct, although they appear to be continuous. 10. That which happens in



extremes is sensated in primes, that is, in the brain; the idea of quality, quantity and place results from the difference of all, 11. therefore they are naturally connected, and are held in their own place, in order that they may not suffer themselves to be removed from their places, and from their connection and form; wherefore they cohere to the superior membranes, and to their own nerves and vessels; no matter what then disturbs them from their seat and natural form, this is sensated, it is only change of state which produces sensation; nor can anything happen without a change of state wherefore those tunics are placed around that they may hold all things in connection. 12. There are therefore many nerves together, that is, compositions of nerves, which sensate it and which are modified, and carry it away to the cortical substance of the spinal axis, the medulla oblongata, the cerebellum and the cerebrum; for every sensation is carried away to every cortical substance. 13. There are therefore congeries of parts which undergo those changes in the medulla spinalis and in the brain; perhaps the whole medullary and cortical brain from the change thence induced reverberates the senses. 14. The brain is divided into parts; these greater and less congeries of the tunic are changed by the grosser sensations; but the contacts are changed by particular modes, likewise their every substance. 15. As are the congeries, such are the sensations, ruder and simpler, thence [as] is the difference of the sense of touch, taste and smell, to which they answer, such are the congeries in the brain. 16. There are corresponding divisions in the medulla spinalis, but unobservable as in media. 17. Whatever comes to the medulla spinalis, passes inevitably into the cerebellum, for a royal road leads thither, and the medulla spinalis is an appendix to the cerebellum and the cerebrum. 18. The cerebellum, which is a unique bed, perceives the very moments of touch, which do not arrive at the consciousness of the cerebrum; yea, many things which the cerebrum does not observe; otherwise it would be unable to change the states suitably, for that comes from the cerebellum. 19. From the contact of many papillæ comes a modification of many nerves, and a change of

the state of many beginnings in the cerebrum. 20. The varieties of sense are many, being constantly according to the qualities of the organs, their situation in the body, the qualities of the reticular tunic, the qualities of the epidermis. 21. Qualities can be varied in endless modes: they can be sharpened, they can be dulled. 22. They have a maximum and a minimum; the maximum is not sensated as sense but as affection, as, for instance, when the whole [cutis] is surrounded with cold, and when the whole is compressed. 23. The smaller the part which is touched, the sharper is the sensation. 24. The senses are likewise circumstanced according to the state of the nerves and the state of the brain.

*In order that it may know the states of the atmosphere and the ether and be suitably changed:* 1. As respects cold and heat, drought and humidity, etc. 2. Hence it is instantly contracted or expanded, and constitutes itself a guard of the kingdom, in respect to all that affection, and a similar [affection] breaks forth into the body. 3. Wherefore it acts with the associate group, and it is because of the contiguity and propagation of those things that it may know what one thing touches another. 4. There are many affections of the atmosphere, which do not come to the consciousness of the cerebrum and cerebellum; these exist in the purer atmosphere; whence we see that the body is disposed by outmost causes of which we know nothing; and we bear a certain sympathy with the affection of the air, as do barometers, especially those who have been affected in some manner; that sense returns into the place of the affection of those things. 5. Wherefore there are instincts which the cerebellum and nature feel, of which our mind does not become conscious, except in effects alone in what is immediately present; thus, we forecast tempests. 6. These are external causes of changes on the part of the circumfluent world.

*In order that the skin may undergo changes according to all the affections of the body, animus, mind and soul.* 1. These are the internal causes, with which a communication of the microcosm with the macrocosm takes place,



that is to say, they are the reactive force. 2. From these things the state of those organs is changed; they are expanded, or contracted, or they tremble, or grow soft, or grow hot, or grow cold; or they are thus and so arranged, hence there is a certain sense from themselves,—sweet, sad or sportive. 3. This is according to the state of the body, its need, hunger, constitution, blood, pleasures, pain; 4. according to the state of the animus, its joy, sadness, wrath, fear, etc.; 5. according to the desires of the animus for good or evil; 6. especially according to the states of the soul which in itself embraces all the affections and changes of the body; 7. thence especially flow effects, as in the macrocosm, that is to say, that it may admit them as nourishment or send them out.

*In order that thus it may be able to arrange the communications.* 1. For emissaries, both those which select food from the atmosphere, and those which send forth effluvia and sweats, flow through that substance. 2. Little canals are inwoven in it, and are comprehended by it. 3. Wherefore all changes of state from the papillary congeries return into it; these it either closes or opens, or otherwise arranges. 4. *For every change of state begins from sensation, as does life from sense; life is in sense.* 5. The affection of the papillary substance and its change must precede, thence the effect returns into the single things, especially into those that are contiguous. 6. Thence come the phenomena of perspirations, of sweats, of absorptions, and of many other things; for the microcosm is like the world which now draws down and absorbs rain and the effluvia of the earth, now indeed sends back and repels them, and clears itself of disorderly things and calms itself. 7. A similar state is put on by the glands and excretory organs, as in the little sensories themselves, and is propagated into all of them. 8. Wherefore the states of inmost and outmost things mutually correspond to each other, that is to say, the states of the papillæ, of the skin and of the cortical substances of the brain; wherefore both extremes of the fibres; such as is one extreme, such is the other, and the intermediate.

*It is to be observed:* 1. There is a sense of touch which is not an impression of the papillæ; for it cannot cause any sensation in the cerebrum, for the intrusion alone of the nerve and its form does not produce sensation; for no change of state returns thence, however far it is bent. 2. But there is at one and the same time a disturbance of the papillæ from their seat, connection, form, etc. 3. For thence from the contact and connection of one papillæ with another, there arises a kind of friction, drawing, twisting and titillation; for they cohere and wish to remain in their own form. 4. Thence a certain change of state, contraction and expansion, from the change of the common form, returns into the several papillæ. 5. Wherefore the congeries of those papillæ appear to be continuous, and their forms are spiral, circular, variously insinuated, curved and linear. 6. The same thing contributes to this as contributes to holding the papillæ in their common form; as, for instance, the scales, which are variously interlaced in them and which variously move and impress the connection in various places, wherefore when the scales are cut away or the papillæ laid bare it is perceived to be more acute than the other senses; there is pain of state, etc. 7. Then also the reticular tunic, which also holds the same connection, 8. besides also the outlets, the trajected emissaries, the vessels, the nerves, the glands, which since they hold the position and connection together, and, those things being disturbed, a change of state returns into the nerves, the loci, the forms, thence friction. 9. Wherefore such an affection returns from the single papillæ into the brain, from the single papillæ a change of state returns. 10. Thus there is a distinct change of the state of all the papillæ, that is, a common idea affects us. 11. There is a similar connection between the cortical glands, which while they similarly undergo a change of their external state, then it returns into their common congeries, whence touch belongs to the congeries.

(*To be continued.*)



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## Editorial Notes

### THE WORK ON GENERATION.

We much regret having had to again disappoint the subscribers to the forthcoming edition of Swedenborg's work on GENERATION, and we feel that we owe them some explanation. At the time of our last writing it seemed certain that the work would be ready for distribution by October the first. But though the revision was then practically completed, unforeseen difficulties and delays were experienced. We had expected that the first part of the work could be set up while the latter part was being prepared for the printer and the indexes being made, but this was found to be impracticable. The indexing also presented more difficulties than had been anticipated; and in addition, the work was being done in the midst of many professional duties.

The finished copy of the revised translation was delivered to the publishers at the end of September. In this copy the revisions had been entered in the margin of the former translation, but these revisions were so many that at the urgent request of the printer it was finally decided to make a clean typewritten copy of the whole work. This, with the necessary proof reading, entailed still further delay, and in addition, the printer found that he could not commence the work until the middle of December. At that time the clean copy was placed in his hands and the work of printing was actually begun. We were assured that the work would be finished in time to publish the book by February the first at the latest. The printing, however, has not been progressing as rapidly as we had expected, so that we are unable to set any definite date for publication,—

a self-denial, the prudence of which is confirmed by past experience. We can only assure subscribers that the publishers will use their best endeavors to forward the printing as rapidly as possible.

The following table of the subscriptions thus far received for the work on GENERATION may be of interest to our readers :

Number of subscribers . . . . .	123	U. S.,	Mass., . . . . .	7
Number of subscriptions,			Md., . . . . .	1
Paid, . . . . .	21		Min., . . . . .	1
Unpaid, . . . . .	131		N. Y., . . . . .	10
	<hr/>		O., . . . . .	4
	152		Pa., . . . . .	67
Subscriptions by States and			Wash., . . . . .	2
countries :			Canada, . . . . .	17
U. S., Calif., . . . . .	7		England, . . . . .	3
Col., . . . . .	6		Australia, . . . . .	2
Con., . . . . .	1			
D. C., . . . . .	3			
Ill., . . . . .	20			
La., . . . . .	1			
				<hr/>
				152

#### "TOUCH OR THE CUTICULAR SENSE."

In our last issue we printed the first installment of Swedenborg's work, entitled "Touch or the Cuticular Sense," translated by Professor Enoch S. Price. The work is a first draft or outline of what was afterwards printed by the author himself as Part III. of the ANIMAL KINGDOM (2 A. K. 470, *seq.*).

This fact, of course, detracts from its value in some respects, but it also adds to it a peculiar interest, and one that is keenly appreciated by the literary world. We refer to the opportunity which the publication of this first draft affords, of comparison with the finished work, and thus, as it were, of seeing our philosopher at work noting down those suggestions and intuitions which were afterwards to be developed into a masterly treatise.

But aside from this literary interest, the first draft preserves also more or less of its scientific value as a contribution to a fuller knowledge of the subjects discussed. For the finished work is so fundamentally changed in arrangement that it would seem impossible but that many suggestions in the first draft had been passed by,—indeed we are assured that such is actually the case. In any event the two treatments set forth



the various phases of the subject in different settings and connections, and both will doubtless be necessary to a fuller comprehension of the author's doctrine. We may add that the fact that the work now being printed is like the preceding parts of the *SENSES*, a first draft consisting largely of notes and propositions to be developed later, affords some apology for the abrupt and sometimes obscure language of the translation.

This first draft has never before been printed, and the present translation is made from a transcript of the photolithographed manuscript made by the Rev. E. E. Iungerich and revised by the present writer. The manuscript is in parts extremely difficult to read, and despite the painstaking labor of Mr. Iungerich, whose high degree of skill in this work deserves special mention, there are still a number of readings that cannot be determined with certainty. These words are marked in the printed translation, and we shall be glad to receive from such of our readers as have access to the photolithographed MSS. (Vol. VI., p. 41-57) suggestions as to the correct reading of these words. Emendations can be incorporated in the translation when it is published in book form.

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"THE HISTORY OF CREATION."

THE HISTORY OF CREATION. BY EMANUEL SWEDENBORG. Translated by Alfred Acton. Academy of the New Church, Bryn Athyn, Pa. 1911. pp. 56. Price, 35 cents.

In point of print, paper, and general appearance this booklet is one of the most pleasing that has come to our notice. It comprises, (1) a bibliographical introduction, which deals also with the work commonly known as the *ADVERSARIA* (pp. 1-9); (2) the text of the translation (pp. 10-42); and (3) an Appendix of "Notes by the Translator" (pp. 45-56). The Notes are an elucidation from Swedenborg's other writings, of certain statements made in the text, the main subjects dealt with being the statements respecting "three Persons" in the Godhead, and those respecting the "Prince of this world" or the devil.

Any estimation of the work of the translator and editor must be left to others, but we are glad to have the opportunity of calling attention to a minor error contained in the Notes on page 56. It is here said that when Swedenborg speaks, in SPIRITUAL DIARY, n. 3217, of "certain writings indited and put forth (*editis*) by me concerning the devil," he "can refer to no other than the present work, (HISTORY OF CREATION), and its continuation the ADVERSARIA." That the passage in question does refer to these works we do not in the least doubt; but the direct reference is plainly to the WORSHIP AND LOVE OF GOD, which, in fact, is the only one of the three works that can be said to have been "put forth," *i. e.*, published, by the author.

THE HISTORY OF CREATION, as declared by the author himself, is an examination of the early chapters of Genesis undertaken with the avowed purpose of comparing the teachings of Revelation with the conclusions reached by philosophical reasoning. The creation, Paradise, and the birth of Adam, says Swedenborg, had already been dealt with in the WORSHIP AND LOVE OF GOD,—and also, we may add, in the PRINCIPIA, of which the WORSHIP AND LOVE OF GOD *may* be regarded, as in part, a continuation and crown,—but they had been dealt with "under the guidance of the understanding, or according to the thread of reason;" and since no trust is to be placed in this unless it is inspired by God, therefore the author sets out to compare his former teaching with the revelation given in Scripture. He was "amazed" at the agreement which he found between the two (H. C. 9-10). And well might he be amazed, for under his self-convincing interpretation the early chapters of Genesis are seen to be,—not as many have supposed a mere allegory or a correspondential story describing things of the purely mental world, but an account written in the style of a primitive but wise race, of the actual creation of our earth. The philosophical reasonings of the PRINCIPIA, with their corollary and crown in the WORSHIP AND LOVE OF GOD, are seen to be in complete harmony with the Mosaic account of creation, and reason is confirmed by Revelation.

At a time like the present when Revelation, and especially that contained in the early chapters of Genesis, is almost uni-



versally rejected as beyond credence, or is explained away as something purely allegorical, there is perhaps no work so useful for establishing upon a firmer basis the Christian's belief in the authority of Scripture, and, perchance, for leading to such belief those who under the stress of doubt and hostile criticism have in effect rejected it, than this little booklet whose contents are now for the first time presented to the English reader.

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## THE SENSES.

### TOUCH, OR THE CUTICULAR SENSE.

TRANSLATED BY ENOCH S. PRICE, A. M.

15. 12. Perchance the connection of the parts is more distinct in every papillæ on account of the connection; so that while it is depressed, the state of the parts is instantly changed; this returns distinctly to the cerebellum. 13. This is the cause of sensation, which cannot take place without a change of the state of the parts, that is to say, unless they be hurt, or resisted, etc. 14. Hence it is evident what the common form contributes to the particular form of the changes of state. 15. A similar change happens in the whole medullary substance as in the cortical substance of the brain.

*Meanwhile the sense of touch is everywhere, it excites its organ to act according to its structure and nature; that is to say, 1. It excites the cuticle, the muscles, the regions of the abdomen and chest, in one way; 2. the lips, the cavity of the palate, wherein it excites appetite, in another way; 3. the mammæ, where it excites desire, in yet another. 4. It even erects the penis itself, and the corresponding members of the other sex, by touch, to the extreme point of desire; 5. even by the touch of the neighboring parts; 6. to say nothing of the effect of taste and smell.*

*The organic papillary forms, although in particular, they vary in respect to form, fluxion, density and many accidents, are yet seen in general to agree, 1. because they consist of the most distinct parts, whether papillæ, the serico-villous portions,*

or the pyramidal or conical forms, as similar forms in the tongue, nostrils, intestines and stomach, but because they are packed into one form and cohere, they seem to coalesce into one forest, as it were, or one body. 2. But the form of the composition seems to be according to the degree of this sense, that is, of touch, since many of them are united, as it were, into one congeries, and this congeries again into a larger one, according to the mode of the composition in the brains; 3. so that there may be simple forms, of these composite forms, and of these again composite forms; as more frequently appears in the muscles, and especially in the brain where are similar circular and spiral forms, but in various clusters again and again compounded. 4. Microscopic examination itself also seems to confirm this; for the distinctions indeed appear, while the interstices or foramina have been counted by Leeuwenhoek; 5. for while the larger ones are apparent to the eyes, the smaller ones are seen by means of the microscope; it is allowable to argue that there are still smaller ones, which cannot be reached by the keenness of the microscope. 6. The very effects prove the same, for a change of the form produces a sensation, which can be sharpened even to the sharpest, so that the change may pass over to inmost things.

*The form itself of each papilla can scarcely be examined,* for, 1. it cannot be distinctly examined with a microscope, 2. but when adjoined to neighboring papillæ it can. 3. It cannot then be hollow,\* but in itself it can possess a form, which will correspond to the greater or exposed forms. 4. Therefore it is explorable by the doctrine of order and degrees; 5. as for instance the cortical gland is not a vesicle, but it contains many vesicles which the human mind can never explore.

*It is in general true that the papillæ are the extremities of the nerves.* 1. As for instance, the papillæ in the tongue, the nostrils, the intestines; 2. because they are sensitive, 3. and are extremities which correspond to their own beginnings in the brain. 4. Sensation does not come from the extremity of the artery.

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\*Words marked with asterisk reading is uncertain. indicate that in the MS. the Latin



*If they are the extremities of the nerves formed organically for receiving sensation, it follows that the nerve does not end there.* 1. For there is everywhere a circle and a continuous path. 2. The beginning is where the end is. 3. The spirit which is conveyed thither through the nerves, goes further, nor does it slip through the cuticles, for nature does not suffer the loss of its spirit. 4. Wherefore it is only an outlet and turning point, that is, an exit from the papilla, in order that the spirituous humor may circulate. 5. This filament must be of very great fineness. 6. This filament returning from the papilla furnishes a kind of new thrum, which, united to others of that first congeries, must certainly form a kind of little canal. 7. Wherefore that papilla is a new beginning of some nervous thread, which must be called a nervous fibre; 8. this, united to many as in the brain, constitutes the corporeal fibre.

*The little canal formed of these corporeal fibres, that is, of papillæ, seems to be that which attracts elements, especially from the ether, perhaps also from the purest air; for,* 1. that the body nourishes itself by its cuticular envelope, all experience confirms. 2. For these are men who have lived months and years without food. 3. There are kinds of animals which likewise have lived months and years, as for instance, bears, chameleons, etc. 4. The same thing is met with in the vegetable kingdom, namely, that there are plants which are nourished by the sun, air and ether, such as the sempervivum, the aloes and others; 5. perhaps also trees and other plants having roots. 6. In the mineral kingdom likewise; for a salt attracts elements from the air and ether and increases and nourishes itself thereby, as for instance, nitre, sal ammoniac, common salt, vitriol, its oil, especially its ash, which continually increases. 7. Hence come so many wonderful kinds of verdigris as the solutions of these salts are impregnated by the air; these sometimes penetrate through and through. 8. In a word, a new kind always draws similar things to itself, for in the air float the purest elements, especially in the ether; there is nothing that cannot be got from them; it is only the form which varies the thing; the elements, the simples, the unities are the same; 9. as has been observed in respect to the blood in

the animal kingdom; concerning these things see the ECONOMY OF THE ANIMAL KINGDOM. 10. In a word, perhaps also metals. 11. Thus the whole universe serves the kingdoms and the animal body, for the sake of which is all the rest, yea, the universe. 12. Death dealing contagions, the rising of life from effluvias alone, sudden changes, if only such spirits as are attracted from the air and dwell in it, be applied, sufficiently confirm this, as many things for restoring the strength.\*

*That the little canal carries away those elements even to the brain and its cortical substance and thence produces the animal spirit.* 1. This is also evident; from sudden changes in the beginnings, as has been said; 2. from the animal spirit itself, which consists of the purest essences of life, mixed with the purest elements. 3. All spirits of a similar origin are ascribable to this. 4. It has reference to the blood, for this consists of animal spirit, and the somewhat gross atmospheric elements; so the animal spirit consists of ethereal elements. 5. Those elements cannot be drawn through the chyle, for those foods cannot be so far dissolved. 6. Other phenomena also dictate the same conclusion as those which have been mentioned. 7. Furthermore [it is drawn] also through the lungs, as has been noticed in the chapter on the Lungs; 8. from continuous want of such elements, 9. that the attraction happens especially in the time of sleep, more in infancy than in advanced age, 10. while this perspiration is restrained, it seems to be all up with life or the spirit to be deprived of its nutritious juice; and thus the blood to labor, whence fever arises. 11. Inspiration is as necessary as expiration; for there is a perpetual alternation, as in the vegetable and mineral kingdoms. 12. These pores cannot be visible, for the elements are exceedingly pure, myriads of which are scarcely visible to the microscope. 13. They depend upon the inmost affections of the soul in order that they may be opened. 14. That when these pores are closed, the expiratory pores are opened, can be concluded from the organism.

*But to find the way by which they go from the skin to the brain, that it, from the surface to the centers, is difficult; it even appears very likely that they go by the arterial way.*



1. For the inmost tunic of the artery is called the nervous tunic. 2. It seems to be composed of little canals of this kind. 3. A multitude of arteries and their ends or origins are subjoined to this layer; so that they closely apply themselves; 4. thus so that they seem to be the beginnings of the arteries; the ends also are not far away, of which we shall treat soon, for where the beginnings are there are the ends. 5. This inmost tunic of the arteries leads even into the aorta and thence into the carotids, and the vertebral artery, and thus towards the brain, from all the branches, including the subclavians and others. 6. This tunic remains in the ultimate brain, 7. and inserts itself in the cortical substances, into which the arterial branches are not inserted, but this very tunic, as will be seen in the following Part on the Brain. 8. That the cortical glands are laboratories for the spirit is acknowledged by all; Malpighi has said many things about them. 9. Now also something may be said in respect to these glands; it seems that it can be doubted, that they pour similar essences immediately into the blood; 10. but perhaps it is by a venous path, for the inmost tunic of the artery is continued to the outmost tunic of the veins. 11. The infantile skin, which consists of a mere vascular congeries, whence it is ruddy, confirms this still better. 12. Also from the beginning of the chick, in that the vessels are somewhat far away before they venture to approach their heart and brain. 14. Finally also that nothing leads to the brain and, indeed, the medulla spinalis in chicks and embryos until it has provided blood vessels; these begin in the extremes while the fibre begins in inmosts; for it first sends off to the cuticles the cutaneous fibres. 15. Yea, the skin argues the same thing; in ultimates is the inchoament, which ultimate exists that the blood vessels may correspond to firsts\*; 16. and it [the little canal] must start from an ample beginning, in that it nourishes the whole kingdom lest there be a false origin of the mind, thus from the whole skin. 17. There seems to be such an origin of the animal spirit, that is to say, that the brain seeks out the purest elements from the cuticles and the whole world to which it adds its own essence. 18. See the chapter on the Peritoneum how the universal inferior essence unites itself to the superior.

*It is confirmed also by this, that they are attracted by the tubules in which is the most exquisite sensation, and where it is immediately associated with the animal spirit, for, 1. the little canal is formed from filaments of the papillæ in some of their interstices; every papilla gives its filament to this little canal, that is, to this corporeal fibre which is to be built up; 2. wherefore the papilla instantly perceives what agrees or disagrees; 3. for the nervous fibre is reflected, and from a new beginning takes on a new character. 4. That fibre is nervous through its whole way from its first origin; it becomes corporeal in its second origin. 5. It corresponds to the cortical substance in the brains, which perceives what floats into the outmost, and it does not admit anything but what is agreeable, thus the brain is there present in ultimates; distance does not matter. 6. From such a sensitive origin a fibre of this kind must arise; it can also be called the venous fibre, while the fibre which springs from the brain is the astitial fibre. 7. The animal spirit is also present in that [vehous] fibre, or a grosser spirit which flows down between the fibres and unburdens itself into the papillæ. 8. And thus, in order that there may be an immediate copulation and an affinity, which allures such things.*

*It is to be added, that it is not attraction but invitation by the force of incitation, for the organic papilla animates, that is, is expanded and contracted, according to the alternate motions of the brain. 1. For every motion in the brain and its beginnings, a like motion is in the fibres thence arising, that is to say, an alternate animation; 2. wherefore also in the extremes where the fibre has become organic. 3. From this animation of many fibres a motion of expansion is induced, and a motion of contraction is propelled; 4. and indeed from its beginnings into the consequents. 5. It is similar to what obtains in the animal spirit flowing from the brain through the fibres with which they [the little canals] coincide. 6. Thence an attraction arises according to the laws of physics. 7. Therefore, in this whole cuticle there is a kind of respiration similar to that of the lungs; for the animations of the lungs and those of the brain coincide. 8. The respiration of the lungs*



is the secondary and corporeal cause of those systoles, and it acts upon the whole congeries. 9. By the second and sublime use which the papillary tunic presents, a very subtile nutriment is furnished to the whole body. 10. The other tunics are also for the sake of this use, that is, the epidermis and the reticular tunic; 11. nor does the Sanctorian perspiration and the sweat hinder this, for these elements are very pure, and, like the magnetic aura through water and glass, they pass through the scales, 12. through the pores of the scales. 13. It also absorbs the effluvia, if there be any in them which is pure and suitable. 14. The soul or nature is especially in command of these things.

16. *From the connection it follows that the microscopic pores discovered and counted by Leeuwenhoek, are the same as those which furnish the origins to the arteries in the body.*

1. For all things are to be considered from smallest things; 2. the arteries at the same time as the veins; 3. and indeed in ultimates, because the blood is the ultimate liquor of the animal kingdom, that is, the inferior universal essence. 4. Nor can it arise from the dilatation of the fibre, because it is contrary to nature and experience that the same little canal should carry fluids of two grades. 5. It is necessary that there be origins, and that where the origins are, there finally are the ends, according to the order of nature everywhere. 6. These pores can become visible by means of the microscope, for the grosser elements and the effluvia themselves are seen in great abundance, see Boerhaave on the Sanctorian perspiration. 7. Wherefore it expels those things in the arteries in their alternates, or rather, from their lateral branches, which can become turgid with blood. 8. Every effluvium presented is expelled by the arteries, never by the fibres; thus the arterial capillaries are extremities, and second origins.

*The very papillary form argues this, as also the ducts or pores.* 1. For the pores of the first order produce fibres; these fibres weave the little canal which is an arterial capillary, the inmost tunic of which it constitutes. 2. The inmost tunic remains in the ultimate threads\* the rest being cast off and

laid aside. 3. This pore itself is in the midst between most subtile pores, therefore the little canal thus formed is in the midst between the filaments; for the papillary form is a compound, and it is composed of simples. 4. Thus the filaments themselves of this membrane attract, and the canal woven from these fibres expels, which is also agreeable to the order of nature. 5. The papillary form is best perceived from an understanding of its genesis, and it conforms itself. 6. But there are lateral ramifications which are never perceived unless they become continually\* turgid with red blood. 7. In that case they only become turgid when the blood wishes to unburden itself of abundance, as in some men, in horses and other beasts.

*That they pass through the little sensories, that is, the papillæ, argues the same thing.* 1. For what that sense abhors as unsuitable, it expels, 2. according to the state of the cerebrum and cerebellum the fibres of which in the extremes carry all that belongs to the parent.

*Many other things also argue the same;* 1. as, the great multiplication of arteries in embryos and infants; 2. the insertions of arteries there; 3. the threads running through this stratum; for between the arteries and the veins there is an endless number of white filaments, 4. which run into the arteries, or run back from them. 5. In insects they are, as it were, little intestines. 6. Whole membranes are usually composed of such filaments. 6 [a]. There is a similar continuous expiration in the vegetable kingdom, whence is the odor infilling the whole atmosphere; 7. in the mineral kingdom and from every metal, 8. in which there is an inspiration and an expiration. 9. Whether the origins of these things are glands still more minute is to be sought out below.

11 [a]. *The third kind of pores, that is, the sudorific, will be treated of more at length below where the underlying glandular tunic is treated of;* in the meanwhile it is to be observed: 1. That these pores are visible and large; 2. that they pierce the organic forms of the third degree, that is, those again compounded; 3. that they depend upon the subjoined glands, as is evident; 4. that they are for the sweat; 5. and



that they are amphibious, that is to say, that they may cast off the effluvial vapors, and that at stated turns, they may absorb vapors according to changes of state; 6. that they may remit their sweats received from the atmosphere into the veins; 7. that they are the origins of the veins, etc.

12 [a]. *Experience concerning the glandular tunic:* Under the papillary tunic there are *arterial* and *venous vessels*, then are mentioned *filaments*, as it were *tendinous*, interwoven among and subjoined to them, which are the vascular thrums of the arteries, communicating with the veins, and full of a white humor, but red in inflamed subjects, in the wounded, or those scratched with strigils, or exercised by motion, or affected with shame or anger, in full blooded persons, in those suffering from fevers, in infants and embryos; but returning to their former state they are deprived of their redness; these together with the papillary congeries, constitute that tegument which is properly called the skin. Under this succeeds a kind of *glandular* or *corpuscular congregation*; these *glands* are called *subcutaneous* and *miliary*; which all anatomists after Steno and Malpighi have examined with the eye assisted by the microscope, have described and expressed in plates; the fibres and arterial and venous capillaries terminate in them with a hollow body or emissary follicle, furnished with excretory vessels; these little vessels piercing the papillary substance gape with open mouth under the reticular body and cuticle, according to Morgagni they appear to be projected into the tracts rather than outwardly. From these vessels the sweat, like an unctuous and fatty shower, urinous, saline, sanguineous, ill-smelling, plentifully pours out; wherefore certain of those vessels are called sebaceous. The glands are more or less sparse or thick-set, slender or thicker; they are arranged in an orderly series, almost like the cortical glands of the brain; they occupy the whole surface, as also the concave surface of most of the viscera, the surface of the palate and fauces, of the œsophagus, the stomach and small intestines. Subjacent to this layer, and lying upon the fat, comes a layer or dense congeries of *subcutaneous nerves*; in the hard coverings of the nerves it is rendered quite tenacious

and thick; finally in regard to many things in the other integument, see Boerhaave.

13[a]. *Analysis. The uses of the glandular tunic, that is, of the subcutaneous or miliary glands.* 1. They exist in order that they may be the follicles which shall cast forth the unclean serosity into the air; 2. in order that they may be follicles which shall attract from the air into the veins humors and atmospheric elements, thus that they may be just so many lungs, as it were, in smallest form. 3. That they are the beginnings of the veins; 4. that they are subordinate to the sensory papillæ that they may undergo changes of state, and that effects may enter in, which are suitable to the affection of the sensation; 5. thus that they are secondary beginnings, which communicate with the atmosphere, but only with the aerial. 6. From these things it appears how a similar structure exists in the vegetable kingdom, and a similar in the mineral.

*That they are follicles which cast forth the unclean serosity of the body into the air, therefore, that they are excretories.*

1. As the lungs are excretory or emunctory organs in great continuous quantity, so are these follicles, in continuous quantity, 2. they do as much as the lungs, and more, whence the one can be judged from the other. 3. that they throw off the sweats and many effluvial exhalations, is evident; 4. from the continual effluvia which are exhaled; 5. from humors of different kinds, fatty, watery, oily, foul smelling;\* 6. from the soiling of linens; 7. from the oiliness always apparent in the skin, especially in certain parts, as in the axillæ and elsewhere; 8. from microscopes, under which the skin always appears to be oiled; 9. from the emissary vessels opening through the papillary substance, where perforations and incavations appear visibly, and the yellow, dark and other kinds of matter with which the whole cavity itself is damp; 10. from the drying off of glasses when rubbed with the palms; 11. from the perpetual heat exhaled from the body; 12. from the odor itself sometimes sensible to man, especially from the odor sensible to dogs; 13. from the insertion of the arteries into



these glands; 14. from the efflux of the veins out of them; 15. so that they may be the organic concentrations of the arteries and veins, and their meeting places. 16. The arteries do not end in those glands, but only their little branches, which are led forth perpendicularly from the larger branches, as in the kidneys, whence arises their cortical substance. 17. A comparison can be made with the kidneys, for their emissary vessels in the kidneys constitute the urinary tubes. 18. There is a likeness and thus a comparison of them with similar glands in other viscera, and in the brain, indeed in the great arteries; the emissary vessels of the veins thence arising are drawn forth according to uses into membranes and other organs and are arranged entirely according to use; 19. wherefore we can learn from these things concerning the rest; for the manner is of a similar nature everywhere in general, but in particular there is a variation according to use. 20. These glands can be exemplars of the rest, indeed of all conglomerate glands.

*That they are also organs which attract humors and atmospheric elements from the air into the veins.* This also is evident from experience; 1. for the skin attracts the humors that flow to it; 2. indeed it attracts its own effluvia and its own humors; 3. as its own sweats, which are absorbed from the linen. 4. This is evident from the occasional troublesome dryness of the skin of the hands, and palms; 5. from animals which live for a long time without food, of which above; 6. from a like thing in the other kingdoms; 7. from the need felt by the veins and from the usual custom followed by the veins elsewhere in the body. 8. That according to Morgagni they are seen rather drawn back, or they lie open with a large extended mouth and indrawn;\* 9. that the entrance lies open entirely in the gland, where the shoots from the arteries and veins come together; 10. that the chyle alone would not suffice.

*That they are amphibious and thus that they both expel and attract:* 1. according to every need of the blood; 2. according to the affection of the body; 3. according to the affection of the animus and mind; 4. according to the affection of the atmosphere. 4 [a]. That there are amphibious vessels used elsewhere in the body, as in the intestines, according to the

observation of Albinus, where the arteries both expel and attract the humors, when they bear both a venous and an arterial nature at one and the same time. 5. The glandular structure argues the same thing, for they enter arterial and go forth venous, thus they are at a turning point. 6. Thus what is injected from the arteries, can either be expelled into the air through the emissaries, if the veins refuse it, or be drawn back into the veins if they are thirsty. 7. Wherefore it follows\* that the ducts do likewise with respect to those things which flow to them from the air. 8. A similar thing is evident from the state of embryos, which, in the first time, before these organs have been formed, receive nothing [through the skin]; afterwards they throw back a liquor between the skin and the amnion, then they absorb it. 9. Thus that is done successively and distinctly, which finally after birth exists successively and distinctly at once; 10. for this cuticle in infants is very porous, and is cut up with infinite vessels, and, as it were, with mere vessels.

*These forces, which correspond to the glands, are made for humors and atmospheric elements, wherefore immediately for the blood. But the pores, which we have treated of above, that is, the papillary substances, are made for ethereal elements, wherefore for the animal spirit; thus they differ in fineness according to use.* 1. The elements of the aerial atmosphere are somewhat coarse; 2. as also are its humors; 2 [a]. but those of the ether are more subtile. 3. As the blood is a somewhat coarse liquor, 4. the animal spirit corresponding to it is thinner; 5. both are of a double degree. 6. All the pores traverse the sensitive papillary substance, the organic forms of which are likewise compounded according to degree. 7. The affections of that substance rule and moderate all things; 8. but purer things act distinctly, for there are those which attract and those which expel; otherwise the coarser things which are of one and another character at the same time. 9. All things therefore are according to the affections arising from various causes which the papillary substance takes on. 10. One flows into the other according to the manner of the composition in the rest of the structure.



*That there is a similar expansion and contraction of these glands, wherefore a similar mode of invitation and incitation as in the papillæ;* 1. for the perpendicular arterial ramifications enter beneath; 2. likewise the nerves which are there abundant, and follow the arterial ramifications. 3. The nerve acts upon the extremity as a brain by animating. 4. The papillary substance surrounds and embraces the emissary vessel, wherefore also agitates it with its movements. 5. There cannot be a diverse respiration of two contiguous substances; 6. hence is their alternate expansion and contraction, wherefore invitation and incitation. 7. The invitation is at the time of the attraction of effluvia, the incitation at the time of their expulsion. 8. Hence there are times when they neither attract nor expel, when the incitation entirely corresponds to the invitation. 9. They altogether abhor the air. 10. They admit the ether, and thus especially by this way into the blood. 11. They can be vibrated all the way to the surface along the pulse of the arteries, which are ramified over the surface, but go out perpendicularly.

*That they are lungs in least form, and discrete quantity.* 1. They concur with the motions of the lungs, because with the motion of the brains; 2. because they underlie\* the papillary substance; 3. because they are approached by the nerves;\* 4. they emulate the pulmonary vesicles inserted in [*i. e.*, at the root of] the hairs; these are similar follicles. 5. The underlying muscles concur in a general way, as, for instance, the abdominal and pectoral. 6. By these media the respiration of the lungs reigns in the extremes, thus in all points. 7. Wherefore fleshy threads are interwoven with them, in brutes manifestly muscular fibres; see experience.

*That they are the beginnings of the veins.* 1. For the artery enters, the vein goes out. 2. There the surfaces make the turning point. 3. There are also other beginnings of the veins, that is to say, pure continuations. 4. There are anastomoses. 4 [a]. There are pendulous stiriæ, as in other glands. 5. There are little mouths. 6. Similarly as in the hepatic glands there are beginnings of the hepatic veins, and elsewhere. 7. These

were all beginnings in the beginning of things. 8. In the course of time the beginnings were obliterated, when all things were formed, many anastomoses went off into tendons, 9. and they underlie the layers which consist of various filaments and at the same time of arteries and veins. 10. For there are venous and arterial ramifications which sometimes constitute the whole membrane and the whole mass. 11. But if we consider the beginnings in a simple state they seem to be these things; for when they are once formed, then determinations are formed from them in a very diverse manner; just as nature draws her offspring\* and ways.

*That perhaps thence arises the external venous tunic which corresponds and, as it were, is continued to the internal arterial tunic:* 1. By a similar turning in these glands. 2. The outmost tunic of the artery passes over into the surface of the gland; 3. and immediately passes over in the surface of the vein, 4. the emissary tunic from the papillæ accompanying it. 5. But these are only conjectures.

*That this tunic seems to be extended even into the pericardium.* The reasons which argue this are many: 1. That those glands are secondary beginnings of the vessels, wherefore of the veins; 2. where it is in the initiaement of the arteries, there are the beginnings of the veins; 3. that the heart is likewise a second beginning, and a beginning of the body itself; 4. it is excited by the venous blood; 5. that the tunic of the artery in the evaporatory canalule, which is composed of papillæ, is seen in the glands, and [there] makes a turning; 6. thus the primary and secondary beginnings are united to constitute a third; 7. that the inmost tunic of the pericardium is continued to the external tunic of the vena cava; 8. That this inmost tunic is insinuated into the inmost parts of the heart, according to Lancisi; 9. that from these it is turned in towards the diaphragm, \* \* \* and towards the lungs and their inmost parts. 10. Thus nature begins from primes and ultimates, and returns to secondary beginnings, that is, those in the brain and in the skin, which is also conformable to the experience concerning the beginnings of chicks in eggs. 11. Thus



all intermediates are rightly formed. 12. The internal tunic of the artery is continued to the external of the veins. 13. The venous surface of the heart is the arterial surface of the brain, that it may be active and passive, 14. this is confirmed by other experiences, and especially by the doctrine of forms and influx, etc.

*That the surface of the gland is partly arterial and partly papillary-nervous.* 1. For the emissary vessels of the gland pierce\* the papillary congeries. 2. Thus the papillary threads also unite themselves to form their tunic, 3. as in all other compositions where a like thing occurs. 4. This tunic flows into the surface of the gland; for the little canal, according to Morgagni, is retracted. 5. The inmost tunic of the artery runs into that surface, together with new nerves, 6. wherefore the first beginnings of the corporeal fibers; 7. hence a new beginning comes into existence from two beginnings, which is called corporeal and surrounds the vein which goes forth thence. 8. From these things it is evident of what quality is the reticular\* tunic, the fundamental of the vein, that is, of its outmost, and how it constitutes a third kind of corporeal fibers, which is mingled with prior fibres. 9. These things follow according to all reason and philosophy; experience concurs in this.

*In the embryo first the papillæ seem to be born, and the smaller congeries to be conglomerated.* 1. According to correspondence with the things in the brain, 2. in order that they may receive all the affections of the soul. 3. Nature begins from simple compositions; 4. hence it follows that the embryo attracts something from the ether through the cuticle and the nerves, as the chick through the shell of the egg, according to experience; 5. that it also breathes out and rejects many things which do not agree, through the pores of the second order; 6. these things are absorbed by the veins of the amnion.

*That afterwards the gland is formed, with a third composition of papillæ, and with numerous ducts.* 1. For the first beginnings must be at hand before a third can be formed. 2. The first beginning is a filament of the papillæ; 2[a] the

second is the little canal thence formed, whence is the artery. 3. From these two joined together in the gland a third is born, that is, the vein, 4. which is under the heart; 5. for every vein is born from something smaller.\* 6. This is evident from the liquor of the amnion which is first pressed out, and afterwards resorbed; 7. from the nature of order and the principles of formation, etc.

14[a]. *From these things it follows that these are three degrees of composition.* 1. As every where in nature; 2. there are three degrees or orders of the composition of the papillæ; 2[a]. three degrees or orders of the corporeal fibres. 3. The first composition is the very simple, which arises from every papilla; 4. the second is the little canal thence arising, that is, the beginning of the artery; 5. the third, that is, the vein, arises from the prior two. 6. How the one arises from the other has been expounded above.

*Therefore there are three degrees of corporeal fibres in the skin, and formed afterwards in the single hollow viscera, which return to their own beginnings.* 1. The first is, as has been said, that which arises from the simple papilla, and is a fibre of the brain, but now arisen from a new corporeal beginning; 2. the second is the fibre thence compounded, that is, the little arterial canal; 3. the third, that is, the little venous canal, is from this last fibre and the one that arose before it. 4. These compositions must be called passive, respectively, to the fibres of the brain, which are active.

*From these things it is evident how universal essences arise, are determined, and reunite themselves in their beginnings, according to the doctrine of universals in the chapter on the Peritoneum.*

[THE ADIPOSE MEMBRANE.]

15[a]. EXPERIENCE. The adipose membrane is furnished with cells not always equal, with layers mutually folded together and superimposed upon one another; there the fat is soft and fluent; this is interjected into all the interstices of the muscles. From this layer break forth bulbs or tumors which



are the roots of the hairs, which break through the single layers and the cuticle itself.

### *Analysis.*

15[b]. *Every embodiment of the blood, that is, its better part, insinuates itself into the fat.* 1. Lest it be evaporated and sweated out with the effluvia. 2. Those effluvia, especially the coarser, are also fatty and oily; 3. thus just as they are in the omentum, 4. that there may be a restitution thence into the blood through the veins, and that the blood may be fed in time of need. 5. How true fat is distinguished from the spurious and defiled, depends on the invitation of the fat itself from incitation through the arterial capillaries, the structure of which, their insertion, exertion, and motion correspond.

*That the impurity of the fat is evaporated through certain channels, indeed through the cuticles.* 1. For there is evidently a transit and entrance either into the glands, 2. or about the glands and thus through the chinks about the papillary congeries. 3. For the humor there collected, as appears, is for the most part fatty, and the glands are therefore called sebaceous by Morgagni. 4. Chinks are seen to intervene, and, indeed, round about the little canals which are lubricated. 5. Thus the sweat and the humor of the peritoneum and that of the pleura penetrate by this channel; 6. as has been observed in the chapter on the Pleura.

*That through spiracles this fat lubricates all the smaller cavities with an oily and volatile lubricant;* 1. as between the glands; 2. between the papillæ, their congeries, especially the larger; 3. as in the cortex of the brain, in the abdomen, in the chest; 4. for there is no cavity but must be lubricated, otherwise the parts would grow together. 5. There are foramina, as in the omentum, 6. the lubricant is dispersed by motion into all the cavities. 7. Those vapors are what equalize the pressure of the atmosphere.

*That this fat underlies the superior tunics in order that they may perform their offices in the best and most distinct manner:* 1. as has been observed in respect to the omentum and the

abdominal viscera, which is superimposed;\* 2, it is protected from the immediate motions and impulses of the muscles. 3. Thus it lies, as it were, on a pillow.

*Likewise also of the interstices of the muscles.* 1. This is accomplished by continuity, 2. lest the space be empty; 3. in order that the motion may be facile, 4. at the point of lubrication the fat is soft and yielding.

*The hairs also draw off the impure and wornout fat.* 1. For in order that the bulbs may be inrooted therein, 2. therefore there is a circulation of that fat opening into the bulbs. 3. That the hairs are hollow and consist of such material; 4. also that they are deferent vessels appears from the microscope; 5. furthermore from their ample root.

*That all things contribute to the end that the motion of the lungs shall rule in the parts and in the general.* 1. It has been said that every single papilla is vibrated alternately with the brain; 2. likewise every gland. 3. These things happen in the single parts from causes in the fibres; 4. the first congeries likewise, through its little canal at first arterial, for into it is concentrated the motion of the threads; 5. the congeries still more compounded also from the gland, which rules this congeries. 6. It happens that every single hair is rooted in the fat, and pierces the more general congeries; but the fat is [ruled] by the underlying muscles, which are actuated by the motion of the brain and the lungs. 7. Still more generally by the filaments, that is, the muscular filaments which pierce it, and perform the office of muscles; 8. most generally by the muscles by means of the fatty tunics; 9. but lest voluntary actions should disturb this natural motion, the fatty tunic is interposed. 10. Thus all things concur that that motion shall reign and concur in things most particular and especially in the compounds. 11. Since it is necessary that the extremes, the brain and cuticle, as also the intermediate, that is to say, the lungs themselves, should be moved under the same auspices, therefore also all the included viscera must be so moved; which has been demonstrated.

*See my first excerpts, n. 1.* The comparison between the glands of the brain and of the cuticle. p. b. obverse: That the



glands throw off effluvia, and receive effluvia from the air. p. c.: The cause of the appearance, that now they throw off sweats, now drink in. p. c.: That the miliary glands are the first termini of the veins, and the last of the arteries. p d.: The little canals or the fibres arising from the papillæ. p. d. obverse: That the most minute fibres attract effluvia from the ether.

16[a]. From the above considerations it is evident that the one tunic is made for the sake of the other, the principal of which is the papillary tunic, after this comes the glandular; the rest of the tunics are for the sake of these two, and are servants, each one according to its own nature; to these succeed the muscles, of which there are various layers, inmost, however, is the peritoneum and the Pleura. It would be too much to treat of the use of every single one in respect to another, and thus to describe the series of uses according to the functionating of the tunic.

*(To be continued.)*

## THE FIBRE.

## CHAPTER XII.

THE CONJUNCTIONS AND PLEXUSES OF FIBRES,  
FASCICLES AND NERVES IN BRAIN AND BODY.

228. *In the organic body are the most wonderful anastomoses and intertwinings of fibres, fascicles, and nerves, so that the organic body is as it were a perpetual plexus made up of an infinite number of minute plexuses. It is the fibre that spontaneously flows into such plexuses in the brains; the fascicles of fibres, outside the brain but within the cranium and the vertebral sheath; and the nerves in the body. But the nerves again split up into fascicles, and these into fibres, and these go off into reticular plexuses, webs, and organic forms, which correspond to the plexuses in the brains, as an effect to its causes and causes to their principles. But let us take up these points one by one.*

229. *As regards the FIBRES: These straightway intertwine and connect with each other, as though they feared to progress far from their origin alone. They mutually consociate as it were into fascicles, and commit and pour themselves into some sheath which likewise is a mesh made up of vascular ramifications. Thence they proceed after the manner of fascicles; frequently also they split up into plexuses, which yet are coherent with each other; that is to say, one is continued into another, not unlike what obtains in a spongy structure. For from its universal cortical circuit, both anterior and posterior, nay, from its penetralia, glands, tubercles, and ventricles, the cerebrum sends out fibres which come together in the medullary globe or centrum ovale. Thus fibre runs along with fibre, and fascicle with fascicle; and they intertwine with each other, and then recede and unfold. Hence arise anastomoses and plexuses. Who can guess the manner or the frequency with which the fibres mutually consociate? or the*



*origin of the gathered fibres? whether they come from different hemispheres? from the base of the brain, or from its vertex? from its margins or from its medullas? or whether, simultaneously, they come from the corpora striata, which likewise put forth an abundance of fibre, and distribute it round about? But to resume: There arise as many nodes and mattings, as there are plexuses, whence arises a common node contextured of least nodes, and irresolvable. As regards the fibres of the corpora striata they seem to be intertwined with the fibres of the cerebrum round about, and especially to be woven in with those that go down into the medulla oblongata from the anterior part of the cerebrum. This may be confirmed by many particulars. \*Anyone who is acquainted with the figure of the cerebrum, and with its division into tuberosities and ventricles, will acknowledge the circumflexions and windings of its fibres and the intertwining arising therefrom. But although it proceeds by windings, yet each fibre tends to its companion fibres by the shortest path, and seeks out these companions, wheresoever they be, and foregathers with them.*

**230.** *Again, the fibre of the cerebrum which is carried down into the medulla oblongata, joins itself with the fibre of the cerebellum in the annular protuberance and in the neighborhood of the fourth ventricle, and the two are wonderfully entwined with each other. Thus, the medulla oblongata reduces those great and living twin globes, the cerebrum and cerebellum, into concord and association of office and motion. See above, n. 98.*

**231.** *Moreover, this fibre goes down into the medulla spinalis, and binds and decussates with all the fibres that spring from its axis. For the fibres of the cerebrum and cerebellum run down the spine in the direction of its length, while the fibres proper to this axis run out perpendicularly, obliquely, and spirally. Thus the one fibre necessarily touches, crosses, and binds down the other; nay, very frequently the fibre of one side crosses over to the other side. Hence results such a matting together that the spinal fibres depend on the fibres of the head, and all on the fibres of the cerebrum, and they are*

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\*In the Latin the italics begin here.

so bound together that not one of them is capable of doing anything for itself, unless at the same time it acts for the common weal. Moreover, as a further result, the structure is the more firm and the more protected, the more it is stretched, and exercised, that is, the more readily it is excited into natural motions. For this reason the whole medulla of the encephalon is one continuous plexus and one inextricable node, wherein is not a thread which is entirely of its own jurisdiction unless at the same time it be under the jurisdiction of another and of all. Who then would surmise other than that there is not a single nerve nor the beginning of a nerve which does not derive something of its origin or something of its nature from both brains and at the same time from both their medullas? This is openly supported by Boerhaave; see above, n. 45, 46, 47, [48].

**232.** As regards the FASCICLES of fibres: Issuing from the medullary stem singly and in scattered order, they mutually unite into bundles which finally become nerves under a common tunic, that is, under the dura mater. It is well worthy of note that one fascicle,—now called the beginning of a nerve,—searches for another and seeks it out with such foresight and keenness of vision, that it bends around in circuits, spires, and windings, now bearing downwards and now upwards (as for instance, from the cervical spine through the great foramen of the occiput [n. 117]); and on the way, it climbs over many other fascicles and passes them by, as though it knew the ones with which it was about to live in society as fellow-consorts in the same office, what their quality, and where they were to be found. Thus, each single fibre foresees all that it is about to do in the extremities; and it holds this steadily before its sight as though itself were present in the effects, even while it is in its principles, causes, and naked potencies. Confer Trans. I. n. 260-269.

**233.** Finally, as regards the NERVES: These form anastomoses and plexuses in the body in almost the same way as the fibres do in the brain; and this for the sake of a continuity of cause; namely, lest the marriages of the fibres, happily entered into in the brain, be broken up by the divorces of the



*nerves in the body; and, on the other hand, that these marriages may be reintegrated by ever new conjunctions. For the nerves, as soon as they have pierced the cranium and the vertebral bone, penetrate into the divided kingdom of the body; and, like brothers come forth from the womb of one mother, and who are still nourished by her twin breasts, they rush, one into the bosom and embrace of the other; they come together in the body and the tunic; they again separate; then return and renew their loves; and so on, from time to time, as though they would enter into counsel as to what they should do, and would mutually exhort each other to stand in concord, despite the departure of each of them to its own assigned province, that is to say, to a muscle, an organ, or a gland. Thus, the ultimate fibre of the spine again commingles with the highest fibre of the head, and the next following fibres with the mediate; and they carry out in the body those connections which they had set out to accomplish while they were still in the brain. But to expound the several modes and numbers of these interweavings, and to enter into their ratio, is a work of many years, of many men, of genius, and of many pages.*

**234.** *Moreover, there are in the body many reticular PLEXUSES: namely, the two pulmonary plexuses, the two cardiac,—the greater and the lesser,—the stomachic, or rather the coronary, the three mesenteric, the splenic plexus, the hepatic, and the two renal plexuses,\* not to mention entire fascias or bonds which are in like manner plexiform. For sometimes the nerves or a single larger nerve is broken up into lesser nerves, and these connect and knot with each other at little distances, thereby producing quadrangular or polygonal areas after the manner of a fishing net. For a larger trunk, wherein a number of fibres and fascicles are compacted and bound together by bonds, seems to enjoy a freer flow when it is split up into finer, and at the same kind softer [nerves and fibres];*

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\*The plexuses here mentioned all belong to the sympathetic system. In modern terminology, they are: The anterior and posterior pulmonary; the deep and superficial cardiac; the gastric, or

coronarius ventriculi; the superior and inferior mesenteric and the aortic; the splenic; the hepatic; and the renal and supra-renal.

*for it then transmits its spirits and humors with greater expedition, and, in the extremities where they are finally distributed, it exercises its forces with greater certainty.*

**235.** *There are moreover similar plexuses of fascicles and fibres in the sensory and motory organs, as in the tongue, the eye, the ears, the cuticles, and in the several membranes and muscles. For the organic parts of the body are so many webs and plexuses of fibres and vessels, it being merely their form which results in the effects being such as are presented to view. For since the fibres are so many forces, and since no fibre, and hence no force, is absolutely like another, therefore, from the coalescence and tempering of such fibres and forces, there is produced in the extremities a form which is called organic, and from the actuation of which, results that effect which is represented as form in the idea\* of the mind. By reflection we notice this in our own persons; and we have also the testimony of experience in the observations made upon the bodies of embryos; see Trans. I. n. 267.*

**236.** *Each single nerve is one series and signifies some general action, either simultaneous or successive, because it produces such action. For action belongs to the muscles, and these owe their faculty of action to the nerves; the nerves to the brains; the brains to the cortical substances, and these to the soul. Thus, by means of cortical substances, fibres, nerves, and muscles, the soul produces that action, of which itself cherishes the idea. Fibres, therefore, are, as it were, the rays of its intellectual light, whereby that is represented to it as present, which in actuality, is distant. Every single action, whether simple or compound, is raised up from forces of divers qualities and quantities, that is to say, of divers natures; hence it is raised up from divers origins. In order therefore, that an action may result which shall be suitable to the idea which is represented, the fibre is collected from divers points of the encephalon. This is the reason for the so numerous an-*

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\*It may be noted that the word *Idea*, derived from a Greek word meaning "to see," signifies a picturing or representation of the thought of the intellectual mind.

In the classics the word is used in the sense of archetype, and this meaning is also clearly included in our author's use of the word.



*astomoses and plexuses, both in the region of forces, that is, in the brain, and in the region of action, that is, in the body.*

### CHAPTER XIII.

#### THE GANGLIA OF NERVES.

**237.** *The nerve, especially the intercostal, sometimes tumescs. These tumescences are called ganglia, ganglions, gangli-form plexuses, nodes, tumors, and olivary bodies of the nerves. For the most part they are of an oval shape furnished with tendinous extremities, that is, with head and tail, just like the muscles. They are larger, as for instance the semilunar ganglia; and smaller, as for instance the barley-shaped ganglia of the spinal nerves. They vary in consistency, color, volume, and number. While arising from the combination of a number of nerves, they are for the most part implanted in the nerves of some one trunk. They are contextures and meshes of arteries, veins, and fibres,—nervous, fleshy, and tendinous,—and also of a number of membranes. According to the searching investigations of Lancisi, whose entire description has been premised above, n. 16, for the purpose of this chapter,\* the superior cervical ganglion of the left side is enclosed in three membranes which are slightly increased and thickened by the accession of fibres. The outer of these membranes invests the ganglion loosely, like the tunica vaginalis invests the testis, and by compression of the fingers the enclosed body can be pressed out like a kernel. On the outer side it is woven of reddish fibres; and on the inner side it is lubricous, being moistened by a mild humor like that of the pericardium. The second tunic, which invests the ganglion somewhat closely, consists of tendinous fibres which are more intertwined and coherent with each other. The third tunic, which Lancisi calls the circular tendon, consists of a tendinous substance firmly united to the body of the ganglion, its fibres being contiguous to the fleshy fibres. In the ganglion when boiled and divested of its tunics, he found on the outer surface a kind of nervous*

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\*In the Latin the rest of this paragraph is printed in italics.

network tenaciously entwined in its membranes. Under this network, and arranged in beautiful order, are seen fleshy fibres extending from the vertex to the lowest point. Moreover, emerging from the intermediate commissures of these fibres, are found innumerable fibrils which are joined to the inner tunic. The upper vertex of the ganglion, commonly called the punctum immobile, is attached to the bony fulcrums of the vertebræ and cranium by nerves and membranes. Into this cervical ganglion, just as into other ganglia, are admitted not one, but many nerves; of these, some penetrate the ganglion directly from above, some transversely to the belly and sides, and some obliquely. Most of them go to the internal substance of the ganglion, but some are dispersed through the membranes only. Those that go to the internal substance, appear to be slightly tinged with a sanguineous color, while the others are white. The blood supplied to the ganglia comes from the neighboring arterial and venous trunks; and this, together with the medley of nerves, constitutes a mass, which nevertheless always appears larger than its ingredient bodies and vessels would seem able by themselves to form.

238. *From the anatomy of this ganglion we learn the offices of the other ganglia. For the fibres of the nerves lie so compacted within their tunics, and the fascicles of fibres within theirs, that unless they be unfolded and loosened on the way, it would be impossible for them to pour forth their liquid in that abundance, which the viscera, by reason of their exceeding activity, continually and urgently demand; for in order that the latter may live in the performance of their work, they demand a continuous stream, and one that is nowhere checked. Therefore, in these ganglia, the nerves loosen up their beds, and being thus gifted with freer expansion, propel their fluid onwards. For the ganglia are muscular, being furnished with similar membranes, fleshy fibres, tendinous extremities, belly, and longish figure [as the muscles]; so that when they contract they draw up the continuations of the nerves, and when they unfold they relax the nerves; and they do this distinctly to the whole nerve, distinctly to the beginning of the nerve, and distinctly to the fibres of the fascicle.*



239. *Thus the ganglia, which are the vehicles for the fluid of the nerves, may be called little succenturate brains, and at the same time aids to the lungs in the promotion and transfusion of the nervous juice throughout the whole kingdom. For the ganglia are attached to the vertebræ as to bony fulcrums which are vibrated and moved at every turn of the pulmonary respiration; consequently the appended ganglia are likewise excited to their contractions and expansions, and by these movements the nerves also are drawn up or stretched out, and the nervous juice forwarded through them in a wonderful way. In Trans. II., Chap. i [On the Motion of the Brain], and also in Chap. ii, n. 172-175, I have endeavored to show that the lungs breathe and animate synchronously with the cerebra, and this for the reason that the spirit may thereby be more expeditiously promoted through the fibres, and the juice through the fistular structure of the nerves. For the cerebra inspire the single fibres, that is to say, they excite them severally to action; and at the same moments, the lungs either stretch or draw up the fascicles of fibres. Thus the lungs add to the fibres an external and general force, while the cerebra inspire in them an internal and particular force. For each single fibre, when swollen and filled with spirit, contracts from its former longitudinal extension, and becomes a shorter canal; since, however, the action is a general one, this is not easily accomplished without an external or pulmonic aid whereby the nerve is relaxed simultaneously. As to the mode in which the lungs concur to the transfusion of the nervous juice throughout the body, this is done with manifold skill. But a recountal of the several modes does not belong to this place. Let us therefore keep to the subject of the ganglia. For the most part these are set near the vertebræ and affixed thereto,—like the barley-shaped ganglia of the spinal nerves, and the semi-lunar ganglia of the intercostal nerve; and therefore, when the brain and the medulla spinalis act upon the fibres, the lungs at the same time by their expansion and contraction, act upon the vertebral column and inflect or twist it. The ganglia, which lie at the junctions of the vertebræ, together with the fibres attracted to them, cannot but be excited*

into a similar motion, whereby the nerve proceeding from them is either relaxed or extended. See the whole mechanism explained above in Trans. II., n. 32, 33.

240. *Moreover, the ganglia effect an entire change on the nerves which flow in, in respect both to their surface, their tunic, and their medulla; and they construct and reform them according to every use and series of actions in the extremities. For the nerves which come forth from the ganglia seem to have therein laid aside their old tunic, that is, the dura mater, and to have acquired a new one; for they come forth clothed with a tunic which is either muscular, or nervous, or tendinous. The dura mater cannot perpetually or for any long time act as a tunic around the nerves, since it is made up of vessels,—both its own vessels and those reflected from the body and changed over into tendinous filaments; and by degrees, as these vessels are ramified and recede further away from the origin of their motion, that is, from the heart and brain, they become finer and at last vanish.* This is contrary to the opinion of Baglivi, [*De Fibra Motrice*, Chap. v], who holds that the dura mater is not only the principal cause of the motion of the heart, but is also the origin of its fibres, in that the one position follows from the other. For in order that the dura mater may incite the muscle of the heart to the execution of its alternations, it is necessary that a fibre spring forth therefrom, which shall actuate the motor fibre, or shall act upon the motor fibres. That the dura mater, however, is not continued entire around the nerves beyond the ganglia, is clear from the description of the latter. For the last and inmost tunics of the ganglia are perforated by fascicles and by great numbers of gathered fibres; and the fibres themselves, both the genuine and the sanguineo-motory, enter deeply into these tunics and interpose themselves between them. This is exhibited still more conspicuously in the outgoing nerves; for among these are seen nerves whose tunics are white, somewhat hard, and tendinous, others whose tunics are sanguineous and muscular, and others with nervous and active tunics. Thus the old meningeal tunic is most certainly reformed into a new and different tunic. Add to this that innumerable vessels penetrate the structure



of the nerves, and if, according to the theory of the preceding chapters, the office of these vessels be the weaving of tunics, here certainly, their office should be the restoring of tunics,—a work which the fibres themselves cannot do, inasmuch as they are not ramified like vessels. That the dura mater is contextured of vessels and not of fibres, cannot be demonstrated in a few words, but the place for this demonstration is the Transaction on the Dura Mater.\* For the present we merely remark that this gross meninx consists of a two-fold layer, and that its threads are of a tendinous nature and therefore ligamentary, being by some anatomists called muscular fibres. In this matter, all anatomical investigators are in agreement; that is to say, that the nature of these threads is like that which is usually taken on by vessels when deprived of their blood, as for instance the umbilical and other vessels. This can also be confirmed by the fact that the dura mater in the infant is irrigated by an immense number of vessels which afterwards become tendinous; and by the further fact that the dura mater is a somewhat passive, resistant, and gross membrane, being furnished with no self-power of action. Then again, these vascular cords which have become tendinous, are continued from the corporeal vessels by some path thus far unknown,—of which we shall treat in the above mentioned Transaction. The arteries of the dura mater, from which it derives the principal part of its activity, run between its two layers, and, by continual ramification, finally become exsanguineous; so likewise these vessels when the dura mater is continued over the nerves. The arteries of the dura mater depend in particular on the expansion and constriction of the heart, and in general on the expansion and constriction of the brain, thus on a two-fold origin of motion, as may be seen in Transaction II., Chap. i, § 10, [n. 55 *seq.*]. Therefore, in proportion as they recede further away from these origins of motion, so must they be gradually rendered finer, and at last pass off into secretory tubules,—as is the case with the arteries in all parts of the body. Therefore the dura mater is not continued around the

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\*Cf. n. 168, and see the BRAIN, 257, 286a, *seq.*  
n. 198 *seq.*, particularly n. 202,

nerves, but is reformed in the body, and indeed in various ways, according to every ratio of actions in the extremities,—of which actions, one demands a nerve furnished with a muscular tunic, and another, a nerve furnished with a tendinous tunic; for in the whole animal microcosm there is not a single nerve that is tunicated exactly like another. *But the tunics, not only of the nerves but also of the fascicles, seem to be renovated. For the arterial and venous vessels of the body enter into and penetrate the nervous trunks, and flow longitudinally with the fascicles and fibres, and also bisect the nervous structure both obliquely and transversely.* That in the structure of nerves are found many arteries and veins which continually split up into branches and frequently perforate the nerve transversely, is often mentioned by Leeuwenhoek in the observations premised to this Transaction. These vessels can perform no other use than the restoring of the antiquated and disappearing tunics; for the fact that tunics are made up of vessels and threads of a passive character, has been pointed out above; and also that they secrete a juice and pour it in between the fascicles, and perhaps also between the interstices of the fibres lest these grow together and lest the glands be deprived of their fluids from which are prepared menstrua and animal juices of every kind. *It was also observed above that blood vessels are of a passive nature respectively to fibres, which are most highly active; and that vessels form tunics and at the same time ligaments; also that vessels ramify, but not fibres; from all which it follows, that, in respect to their tunic, the nerves must be reformed in the body in order that a due ratio may be preserved between their action and reaction all the way to the end of their extension, that is to say, to the effect in the extremities.*



## CHAPTER XIV.

## THE VARIETY OF FIBRES, FASCICLES, AND NERVES.

241. *No fibre, no fascicle of fibres, and no nerve is absolutely like another, but is varied both in species and in part. The fibre which is born of the cerebrum is of one quality, that which is born of the cerebellum of another, and that which is born of the medulla oblongata and medulla spinalis, of still another. Yea, neither do the fibres of the cerebrum agree with each other in all their predicates,—there being differences between each one of them. So likewise between the several fibres of the cerebellum, and between those of the [medulla oblongata and] medulla spinalis. For between the cortical glands which are the genitors and nurses of the fibres, there is a perpetual variety which we call an harmonious variety. Hence a like variety is passed on to the offspring, that is, to the fibres; for the fibre inherits the nature of its parent gland. Every fibre is begotten and moulded, yea, and bent, to some use in the extremities; and in every part of the corporeal system the use is varied. Wherefore the fibre derived to the motory organs, is of one nature, and that derived to the sensory organs, of another; that is to say, one kind of fibre is derived to the eyes, another to the ears, another to the tongue, nostrils, cuticles, another to the trachea, another to the stomach, intestines, lungs, heart, mediastinum, liver, pancreas, spleen, loins; soles, elbows, palms, and, in fact, a different kind of fibre to every least portion of these parts. Hence also it follows that each single fascicle composed of fibres of such diverse nature, and likewise each single nerve, has a specific difference from other fascicles and nerves. Effects in the extremities correspond to causes in the beginnings; thus organic parts in the body to organic parts in the brains. Hence comes the variety of the fibres, which are intermediaries and accommodate themselves to both ends. The variety which obtains in the several entities of all the kingdoms of the world, the animal, vegetable and mineral, yea, and in the circumfluent or atmospheric world, is*

*a necessary quality or attribute of universal nature, which is averse to all equality and identity, and shrinks from it as from something destructive of herself; for without variety, there exists in nature, neither thing nor quality; hence come the relations, respects, ratios, harmonies, equilibriums, forms, and beauties of the things of nature; in a word, their perfections, if the variety be harmonious, and contrariwise, if it be inharmonious. Respecting this variety see Trans. I., n. 602, 603, 604, 605, and Trans. II., n. 312-316. Wolff is of the same mind; for he says "That world is more perfect wherein is a greater variety of things consentient. For if, in a world, the variety of things which are mutually consentient is greater, then more things would be observable in that world than in a world where the variety was less. And therefore, since that world is more perfect wherein is a greater number of things observable, it certainly follows, that that world is more perfect wherein is a greater variety of things consentient" (Cosmologia, § 552). The superior and more perfect entities of nature excel over other entities in the fact that they are more susceptible of variety, and hence are more apt for an accidental change of their state, though not for any essential change. Hence comes the perfection of forces and modifications, and their potentiality of being the causes of infinite varieties in things posterior. But this accidental change derogates and takes away nothing from the essence and the attributes thereof. Wherefore this most perfect mutability possessed by superior entities goes ever hand in hand with a most perfect constancy in ever remaining in their own form and essence. But the question is asked, What is an accidental change, and what an essential? Let us learn by examples. A circle or a spherical globe suffers accidental change when it is expanded into a larger circle or sphere, or compressed into a smaller; for the circular or spherical form, that is to say, its essence, still remains. But if the circle is changed into an ellipse or cycloid, and still more if it is changed to some polygonal and angular figure, then it undergoes an essential change, for it no longer remains a circle. So also in other things, as in the atmospheres and the parts thereof, which, howsoever expanded and*



constricted, suffer none but accidental changes; but if they change their form, they change also their essence, and then these parts no longer remain atmospheric, modifiable, and elastic. A muscle when it contracts and dilates undergoes none but accidental change,—and so with the brain, heart, lungs, when they perform their systoles and diastoles; for whether they be more ample or more constricted, they are still muscles, brains, heart, lungs,—which would not be the case if they were changed essentially. The cortical gland undergoes accidental change at every alternation of its animation, and also according to the several modes of sensation,—for the cortical cerebrum is the common sensory; but if it can no longer be expanded or constricted, that is, can no longer draw its breath nor any longer receive sensations, then in that degree it is said to undergo an essential change. So likewise the fibres, so long as they are minute canals,—which, whether wide or narrow, long or short, nevertheless remain fibres; for these varieties arise from some accidental change, nor do they derogate anything from the natural essence and form of the fibres; nay, the latter are the more perfect, the more readily they are able to undergo these changes, that is, the more tender and soft they are. So likewise with every elastic corpuscle,—all of which give way at the least attacking force, and straightway return to their own state; thus they react, altogether as they are acted upon, but do not readily undergo essential change. Such then are the entities of superior nature, that is to say, primitive entities.

242. *And now to enumerate the varieties themselves:* FIBRES are in general, more or less soft or hard, ample or narrow, to say nothing of their being long or short. This is evident from the very anatomy of the fibres in the brains. For the fibres that go to the organs of the senses are softer, and those that go to the muscles are harder; wherefore the former are called sensory nerves, and the latter motory nerves. The nerves of the fifth and seventh pair consist of both kinds, as also is the case with several other nerves, according to the observations of Ridley [n. 18 *fin.*]. Sensation requires a somewhat tender consistency in the nerve, but motion a harder;

for the effect and use in the extremities corresponds to the causes, and, if I may so speak, to the intuition of ends, in the beginnings. Thus the fibre, which acts as the middle cause, is accommodated equally to both ends. *Their tunics or meninges likewise,—these being either tender or gross, and cohering either loosely or strictly. The animal spirit itself, which flows through the fibres, is never absolutely the same in the fibre of one subject as in that of another, as will appear from the genesis of this spirit as shown in the following Transaction;\* and according as is the fluid which flows through a fibre, such also is its tunic, for the one has been and is accommodated to the other.* For, as the tunic of the artery is formed to the nature of its blood, so [the tunic or] highly delicate surface of the fibre is formed to the nature of its fluid. Thus the tunic and its enclosed fluid constitute one vessel, and act as a single cause; see above, n. 151, 152, and Trans. I., n. 134, 135. If therefore the humor is everywhere varied, the fibre also must be varied. *So likewise that chastened humor which permeates the interstices of the fibre.* Respecting this humor see above, n. 192, 194, 197, etc. *Fibres, therefore, transmit a better or a meaner juice or spirit, and this either quickly or slowly and in abundance or sparingly. But to resume: The softer the fibres and the more nearly they approach to the nature of a fluid, the more susceptible are they to accidental change, which is their protection, and the more apt for acting according to their nature. In first infancy, and also near their origin, they are most exceeding soft and open, but in the following period, and at a distance from their origin, they are harder and more constricted. These varieties are indeed few,*

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\*See the little work on the ANIMAL SPIRIT (in Posthumous Tracts), particularly chapter iii. It would appear from this reference to "the following Transaction" as treating of the Animal Spirit, that the present work was written after the plan of the ANIMAL KINGDOM had been formulated. For in all the sketches of the contents of the six Transactions that were to

constitute the ECONOMY OF THE ANIMAL KINGDOM, no mention is made of a separate treatise on the Animal Spirit; but in the prospectus published in the first volume of the ANIMAL KINGDOM, we find that Part ix was to deal with "The Cortical and Medullary Substance; the Nervous Fibre; the Motor Fibre; the Animal Spirit."



*but inasmuch as the degrees of expansion and constriction, and of softness and hardness, are almost infinite in these least substances of animal nature, therefore the varieties cannot be defined by number. For one degree in things compound embraces myriads of such degrees in things more simple. Confer Trans. I., n. 290. It should be known that the differences of varieties in more simple substances are fewer in number because such substances are more universal; wherefore they do not admit of specific differences except such as, relatively to compound or posterior substances, must be called generic. But as to the manner in which such more simple substances are susceptible of infinite accidental changes, see Trans. I., n. 602-606, and Trans. II., n. 312-317.*

**243.** *Fascicles, which are nothing but aggregations of fibres of this kind, derive their nature from their constituent fibres; as, that they are more or less soft or hard, ample or constricted, long or short. But in fascicles many accidents are added, which are extrinsic to the fibres, but intrinsic to the fascicles. Such for instance as the number, size, figure, situation, space, etc., of the fibres,—all which are accidents whereof the essence of the compound entity consists. But in order to the existence of accidents, substances are required, which, inasmuch as they constitute a compound, must be called simple substances. Assuming then that the fibres which compose the fascicle, are such substances, it follows, according to the rules laid down by Wolff in his ONTOLOGY, that “Compound entities are the aggregates of substances” § 793. That “Accidents cannot exist without substances” § 791. That “The essence of a compound ens consists of nothing but mere accidents” § 789. And that “In a compound ens there is nothing substantial except the simple entities” § 792. And although the fibres in fascicles are not truly simple entities such as are referred to by the distinguished philosopher, yet they here represent such simple entities inasmuch as they are the most simple parts that are visible. Nevertheless the fibre consists of its own constituent substances which are still more simple and in respect to which the fibre is a compound entity; and these substances again consist of their constituent substances and at last of the*

most simple substances of nature, that is, the first substances of the created world. But such substances cannot be said to proximately compose a fascicle of fibres, but only most remotely, and indeed by the interval of many degrees. Therefore, accidents are here predicated only of such substances as enter into and form the compound immediately; as, in the present case, the number of the fibres, the resultant size of the fascicle, and the situation, whence come the form and figure both of the whole fascicle and of the interstices between the fibres. And in order that it may be held in its natural situation there is required a nexus and bond; and moreover, a surface which shall so limit the compound that while the fascicle is preserving its essence and determination, each single fibre does the same thing. *Fascicles therefore are made up of many fibres or of few,—consisting either of some hundreds, or of fives, or of pairs; they are made up also of fibres of different natures, and at the same time of arterial and venous vessels and of a greater or less abundance of such vessels. The tunics of the fascicles are more or less coarse or fine, hard or soft, and more or less elastic, active, muscular, sanguineous, fibrous, tendinous, passive, friable, and inter-coherent, since they are triple membranes. So likewise the very ligaments which penetrate from the inmost tunic of the fascicle to the outmost tunic of each fibre. See above, n. 221. For these ligaments are more or less dense or open, continuous or discrete, few or many, yielding or rigid, elastic and active or resistant and passive; and they interpose themselves and colligate the fibres more or less tightly or loosely. The interstices in and between the several fascicles and fibres are varied in like manner. The serous humor which permeates the interstices is never absolutely the same in one subject, or in the nerve of one subject, as in another; for it is more or less tenacious or fluid, fatty or watery, impregnated with homogeneous or heterogeneous elements, abundant or sparse, cold or hot, heavy or light; and so likewise with that oleaginous fluid which flows down between the tunics.*

(To be continued.)



# THE NEW PHILOSOPHY.

VOL. XV.

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No. 2.

## Editorial Notes

The whole of the work on GENERATION with the exception of the indexes, is now in print. There still remains the entry of final corrections, and the making of the plates from which the work will be printed. We are assured that, in the absence of unforeseen delay, the book will be ready for distribution some time in May.

We learn from a private source that the revised English translation of Swedenborg's PRINCIPIA will be published by the London Swedenborg Society in the immediate future, if it has not already appeared by the time these words reach the eye of the reader. The work will be in two volumes, the latter of which will include an English translation of the LESSER PRINCIPIA.

### MISS BEEKMAN'S PHYSIOLOGICAL PAPERS.

For some years past the NEW PHILOSOPHY has confined itself for the most part to the publication of translations of Swedenborg's works,—the translations in question being translations of works hitherto unavailable. This policy was adopted with the thought in mind that there was need of greater familiarity with the actual teachings of our philosopher; but it was never intended to exclude any article that would materially contribute to a better understanding of those works. Of such a nature is the series of PHYSIOLOGICAL PAPERS by Miss Beekman, whose publication is commenced in our present issue.

Miss Beekman's name is already well known to students of Swedenborg, both by her past contributions to the NEW PHIL-

OSOPHY and by her published works, SPECTRUM ANALYSIS and COSMOLOGY. The present papers are in effect a continuation of the last named work, which lays down the doctrine of the Divine Proceeding, that is, the doctrine respecting the atmospheres by means of which the Infinite Esse proceeds to and accomplishes the work of creation. The book ends with a description of the formation of the kingdoms of nature, and more especially of the mineral kingdom. In the PHYSIOLOGICAL PAPERS it is not the kingdom of the Divine Proceeding that is treated of, but that complementary kingdom which may be called the kingdom of the return spheres whereby the circle of creation is completed and ever perpetuated. This doctrine concerns the manner in which the Divine Proceeding lifts up the lowly substances of the earth, and clothing itself with them, presents them in very human form, in man, and angel, and great heaven, image of the Creator and Father.

The first of these papers, introductory to the general subject, gives a foretaste of the many things which the writer brings forward in subsequent papers as a result of her correlation of Swedenborg's physiological and theological writings. Citing the doctrine well known to Newchurchmen, that a knowledge of the human form is necessary to any true conception of philosophy and theology, Miss Beekman points out that in Swedenborg's earlier works alone are to be found those deeper truths respecting that form which will serve this use. The quotations from Swedenborg respecting these works are not altogether unknown, but they have not hitherto been given the full consideration which they justly demand, and to some indeed they will come as new. Yet they are but a few of the many similar testimonies that might be adduced; and startling as they may seem in all that is implied they must yet be given full weight as the testimony of Swedenborg himself. It is the significance of this testimony that is the subject of the first of the PHYSIOLOGICAL PAPERS, and the conclusions there drawn are fully confirmed in the later papers.

While we are on this subject we would call attention to the importance of a familiarity with Swedenborg's earlier works before any judgment can be passed upon them, or any great



avail be made of them for the comprehension of the theological truths of his later writings. The NEW PHILOSOPHY has endeavored to promote this familiarity by its publications; but necessarily this can contribute in only a small degree to the end in view, for the works of Swedenborg are too considerable to allow of serial publication. Many of them, however, are still on the market in English translation,—as may be seen in our advertising pages,—and we doubt not will be more widely read as there is a greater appreciation of their value for the comprehension of the deeper problems of life.

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THE THIRD VOLUME OF THE "COSMOLOGICA."

MISCELLANEA DE REBUS NATURALIBUS. Edidit Alfred H. Stroh. Holmiae, 1911. pp. xxxvii, 328.

We welcome the appearance of this third volume of the magnificent series of Swedenborg's scientific and philosophical texts now being published by the Royal Academy of Sciences of Stockholm. The volume contains a number of Latin and Swedish works written by Swedenborg prior to 1722. The Latin comprise, 1. Principles of Chemistry. 2. Iron and Fire. 3. Finding the Longitude. 4. Construction of Docks and Dykes. 5. The Causes of Things. 6. Corpuscular Philosophy. With the exception of the fourth all these treatises have appeared in English translation, and the first four were published in Latin by the author, but are now exceedingly rare. The Swedish treatises comprise, 1. Fire and Colors. 2. The End of the Earth. 3. The Motion of the Earth and Planets. 4. A Discourse between Mechanica and Chymia on the Constitution of Nature. Excepting the last named all these treatises have been translated into English, but the work on the Motion of the Earth is the only one that was published by the author, copies of the work being now extremely rare. The volume also includes a first cast of this work, in addition to the reprint of the published book.

The "Discourse between Mechanica and Chymia" is a treatise the existence of which was made known to students only very recently. It was unearthed by Mr. Stroh in 1903 while

searching among a collection of Polhem's MSS. in the Royal Library at Stockholm. In the *NEW PHILOSOPHY* for April, 1904, p. 65, Mr. Stroh gives a brief account of its contents, and in *NEW CHURCH LIFE* for February, 1904, p. 64, he discusses the question of its authorship, though without arriving at any definite conclusion. In the preface to the present work, however, he asserts that "there can be no doubt that Polhem drafted the work, but it may be that Swedenborg collaborated." This conclusion, which is strongly supported by the evidence,\* would indicate considerable unity between Polhem and Swedenborg in those theories which the latter afterwards developed in his *CHEMISTRY*.

Mr. Stroh also calls attention to a fact, hitherto unknown, which brings into question the authorship of the little work *DE CAUSIS RERUM*,—a work which hitherto has been unquestionably ascribed to Swedenborg. But Mr. Stroh shows, (*Pref.* p. xxxvi), that among Polhem's MSS. "is a little work, *DE CAUSIS RERUM*, which has contents similar to those contained in the paper written by Swedenborg's hand. Polhem's paper is much longer than Swedenborg's, but contains the same headings and treats of the same subjects." (*Ibid.*)

What we have just summarized is the result of much painstaking research by Mr. Stroh, and students of Swedenborg are indebted to him for his patient investigations, and still more for that enthusiasm and industry to which in large measure is due the publication of the series which includes the volume now under review.

We wish we could speak in as high terms of the Editor's *INTRODUCTION* to this volume. Dealing with "The Sources of Swedenborg's early philosophy of Nature," it undoubtedly contains much valuable information, and contributes to a better understanding of the atmosphere of learning in which Swedenborg lived during his earlier years. But we regret that the

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\*The chief evidence is: 1. The *DIALOGUE* is in Swedenborg's handwriting, but the first draft of the latter part of it is in the handwriting of Polhem. 2. Sweden-

borg sometimes acted as Polhem's amanuensis. 3. While Polhem frequently used "Dialogues" in his writings, Swedenborg never adopted this style.



writer, while dwelling on a superficial agreement between Swedenborg on the one hand and Descartes' theory of vortices and the nebular hypothesis on the other, is silent as to the fundamental differences between the two as shown by a study of the former's *PRINCIPIA* wherein are brought out in basic form those doctrines of degrees and of forms which have no recognition in contemporary literature. Again, in the "Notes" to the volume, the writer while stating that up to 1718 "Swedenborg followed the literal account in Genesis as indisputable, and he attempts all kinds of explanations and reconciliations of the account of creation in Genesis and of the ages of the patriarchs with the natural science of his time," [a statement which itself is open to much dispute]; and that "he became less and less literal as he abstracted his philosophy," and "in his later theological works the accounts in Genesis are continually referred to as being not literally but spiritually true;" yet, omits mention of the important fact that as late as 1745 Swedenborg states that he found a "remarkable agreement" between the Mosaic account of creation and paradise and his own *WORSHIP AND LOVE OF GOD*, and, in consequence with the *PRINCIPIA*.

Of course, matters such as these will necessarily be subject to controversy, and it is this very fact which leads us to regret some features of the *INTRODUCTION* in question. As a monogram it would undoubtedly form a valuable contribution to a right estimate of Swedenborg's writings, but any introduction of this kind is hardly in place in a publication whose aim, so excellently carried out, is to present original documents that shall serve as the basis for the study and discussion of the learned. We feel entire sympathy with the spirit of the suggestions of the Master of the Rolls, that in the Government edition of the *Historical MSS. of Great Britain*, "the editor should give an account of the MSS. . . . that he should add to the work a brief account of the life and times of the author, and any remarks necessary to explain the chronology; but no other note or comment was to be allowed except what might be necessary to establish the correctness of the text."

The volume before us concludes the original series of three volumes for which subscriptions were first called for. But

since that time the liberality of the Royal Academy and the earnestness of Mr. Stroh have combined to much enlarge the scope of the series. In his preface to the present volume the editor, after paying a well deserved tribute to Professor and Mrs. Gustaf Retzius "who have so generously and with unfailing sympathy and kindness supported the editing and publication of the three volumes now issued," goes on to say, that "the backing of the Swedenborg Scientific Association . . . the Academy of the New Church . . . and the Swedenborg Society of London, together with appropriations made by the Royal Swedish Academy of Sciences will secure the inclusion of Swedenborg's *OPERA PHILOSOPHICA ET MINERALIA* in the edition, and the publication of the future volumes of the series to contain Swedenborg's contributions to anatomy, physiology and psychology." Announcement is also made that the fourth volume of the series will include a facsimilie of the *DÆDALUS HYPERBOREUS*.

So far as we know, no arrangements have yet been made for securing subscriptions to this and the following volumes, but doubtless some announcement will be made in the near future.

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### NOTICE.

The Fifteenth Annual Meeting of the SWEDENBORG SCIENTIFIC ASSOCIATION will be held in Philadelphia on Thursday, May 16th, at Odd Fellows' Temple, Room 7A, Floor 7, corner Broad and Arch Streets.

10:30 A. M. Meeting of Board of Directors at 1011 Arch Street.

2 P. M. First Session of Association.

2:30 P. M. President's address.

Election of officers followed by papers and discussion.

Persons wishing to present papers or other communications will kindly communicate with the undersigned.

REGINALD W. BROWN,  
Secretary.



## PHYSIOLOGICAL PAPERS.

BY LILLIAN G. BEEKMAN.

## I.

THE HUMAN FORM. RELIGIOUS AND SPIRITUAL IMPORT OF THE TRUTHS CONCERNING THE CONSTITUTION OF THE HUMAN FORM PECULIAR TO NEW CHURCH THOUGHT. SWEDENBORG ASSISTED BY GOD DIRECTLY WHEN COMPOSING HIS EARLIER WORKS ON THE ARCANUM OF THE HUMAN FORM; AND THIS, BECAUSE THE WORD IN ITS INTERIOR, MAKES ONE WITH THE CONSTITUTION OF THE HUMAN FORM THEREIN SET FORTH.

To the thought of the New Church, the human organism is of peculiar interest and religious import. This statement covers chiefly its interior constitution and action. The verities of the human frame are part of the very texture of our thought concerning the heavens; concerning the relation of the universe to the Creator; and concerning the lines of the development of man both at present in the individual, and as to the future of the race and its hope.

The verities of the interior constitution and order of the human frame must condition all sound theological thought; and moreover they enter into the religion of the heart itself. This is so much the truth, that Swedenborg says that if there is not the idea of God as Man, personally near and present, to whom the heart turns in simplicity as a little child, innocence and true religion cannot be. And he relates a story of a heathen who knelt before an image in the human form. It was an idol; yet he worshipped before it with such a sense of the nearness of God, such humbleness, such adoration, such a feeling as of a child at its mother's breast, that the wisest and most radiant angels were amazed at the innocence and tenderness of the spirit. The greatest wisdom of heaven could easily be implanted in those gracious states. (*Spiritual Diary*, 2411-2413.)

Therefore, the simplest idea of God as Man, as near, as present, gives to the simplest human being a fuller power of rationality and innocence, and a fuller basis for all that can be added in this life or in the other, than is to be had by the wisest, deepest thinker who has lost that idea.

Not only does the idea of the human form thus enter into the religion of the heart itself, but in the verities of the human form, the idea of God peculiar to the New Church, has its root; and by means of those verities comes the illustration, and the enlargement, and the perfecting of that idea. And according to a man's idea of God is his association and place in the universe.

This is alike true, whether the image and idea of God the Lord be that of simple human presence, living, wonderful,—the more powerful, because unseen,—to which our babes bow in their infantile prayers, and to which hourly our own child-like states return; or whether our idea of God regards chiefly that deeper verity of our Lord as Godhead bodily brought forth, and filling the universe in planes, the succession and order of the life of which are those of the human form;—that idea in which are the arcana of the New Church trinity; which is to be its power and its joy; and the study of which is even now the occupation of the growing heart and mind of the deeper thinkers in the Church.

All things exhibited in the universe are recipients, are co-active forms,—forms in some manner recipient of the Divine and co-active with it. Like as a vessel is a recipient of the blood and takes its own throb from the pulsation of that blood, so recipient forms receive the Divine and take the pulsation of life from the throb of the Divine.

Furthermore, all things in the universe are such as they are, in virtue of their form, their inner constitution,—and in virtue of that only. That is, they are such as they are in their difference as to reciprocity and the discrimination of their powers, by reason of difference and specialization of their inner structure or form.

These points of belief are of themselves sufficient to give peculiar point to our thought of the inner constitution and



ordering of the parts composing finite creatures. But to this is added, that the human form as framed from creation is a least effigy and type of the great heaven, and that the human form is nothing else. Add further, that the human organism in the order, nature and arrangement of its parts, presents a little summary of God's creation,—visible as well as invisible.

The Newchurchman necessarily believes that the human form is indeed a unique form, which, in its order of substances, parts and degrees, and its circle of interior activities, is a recipient organism answerable part for part, activity for activity, as in very image, to the grand degrees, relations, and cycles of life in God-Man. By virtue of this organization it is able to reciprocate part for part, degree for degree, cycle for cycle of proceeding and return, with the infinite and living degrees, successions and cycles of proceeding and return of the God-head bodily, which exist in our Lord Jesus Christ, the full image and expression of the Infinite Father,—He who alone is very Man.

"Man was created after the entire image of the macrocosm,—after the image of heaven and after the image of the world. His internal is after the image of heaven, his external after the image of the world. It was thus provided by the Lord in order that through man the Divine may pass over from the spiritual world into the natural world, and be terminated in the ultimate of nature, to wit, in the corporeal; and thus, that through man there shall be connection of the spiritual world with the natural world, so that through man universal nature may glorify the Lord the Creator." (S. D. 4607.)

"When Divine order is represented in form it appears as a Man, for the Lord from whom it is, is the only Man, and so much as angels, spirits, and men have from Him, that is, as much as they are in good and hence truth, thus as much as they are in Divine order, so far are they men. Hence it is that the universal heaven represents one man, and that to it correspond all and single things that are with man." (*Arcana Cœlestia* 4839; 477. *Apocalypse Explained* 1120; 1112. See also *True Christian Religion*, 470; *Divine Providence*, 32.)

It follows, therefore, that the constitution of the human frame conditions the psychology of the Theological Writings; and that our view of the cosmology is the expression of laws of the human form along large and universal lines of the planes of Divine Proceeding as the auras, the successive bodies of

Divine operation in creation, or the substances and forces of the universe.

But the knowledges and ideas of the constitution of the human frame which are of such supreme import to the New-churchman, the knowledges which both involve and express such arcana of creative wisdom, are not the knowledges of this subject commonly obtained in the works on cosmology and in the anatomies and physiologies of the colleges;—indeed, they are often to the contrary of those there set forth and promulgated. They are those which are set forth in Swedenborg's own works and in his works alone;—in fulness in his cosmological and physiological volumes setting forth his principles of the successive order of creation, wherein he treats of that order according to the great definition given in the *TRUE CHRISTIAN RELIGION*, n. 52: "Order is the quality of the disposition, determination and activity of the parts, substances or entities which make the form of a thing." "God introduced order into the universe and all its parts with creation."

The ideas and laws of the human form will be found in Swedenborg's numerous volumes on the constitution and economy of the human recipient, the organism of the soul's kingdom, in which are to be found his doctrine of the correlation of the human frame to the creation at large, and his doctrine of degrees, their nature, their origin, and the laws of their successive composition and resolution.

Moreover, the special points which are set forth in his earlier works, those points in which he differs from all other writers on the subject, are the points chief in his theological writings. In these earlier works, moreover, he speaks with authority concerning planes and relations, facts of structure, and activity of life, that none others have so much as dared to speculate upon. The notable, the astounding things, he declares, are the same as those which in his theological writings are involved everywhere,—either directly and by immediate statements, or by implication as of something commonly understood. Nor can these peculiar ideas and principles of his anatomy and physiology be any more taken out of and separated from those theological writings than the bones can be removed from the



human form, and leave it an effective form, or human, or living.

To most persons Swedenborg's science,—his anatomy and physiology,—are all new, problematical, unique; and it behooves me to here dwell on these subjects, emphasizing the large relations of Swedenborg's doctrines of the human frame to the religion of the New Church, to its theology, its concept of God, of heaven, of the relation of this universe and all things in it to the All-Father. And this, that we may realize that we are entering, as it were, a temple full of the presence of the Lord.

Swedenborg's anatomy and physiology are certainly like no other. In his anatomy he gives the invisible anatomy as well as the visible,—the anatomy of the mind as well as that of the body,—nay, even the anatomy and physiology of the human internal,—if I dare phrase it so;—that human internal which is God present with us, forming the human creature, holding it together, reforming it, ruling and governing in all the interior organs, ruling and governing all the thoughts of the mind. (S. D. 4016.)

In Swedenborg's works is given the making and unmaking of degrees, the order of the substances, parts and forces of the macrocosm as well as of the microcosm. He tells us what is given to the human creature at birth, and what is left to be constructed after birth. In short, the principles and doctrines peculiar to Swedenborg's anatomical and physiological works, his *PRINCIPIA*, his work on the *INFINITE*, are referred to everywhere in the *ARCANA CŒLESTIA* where our Lord's assumption of the Human is treated of, with the order of the growth of His mind, and the glorification.

We know from the Writings that the human form corresponds to the heavens. But in addition to this, the Writings give us the story that when the Word was unfolded, plane after plane, degree after degree, to its inmost, there was the temple splendid, there was the tabernacle represented therein; and then all these, as lower types and lesser realities, were swept away, and our Lord Himself stood there in radiant human fullness. (T. C. R. 187.) Thus every part of the Word corresponds to some part of the human body.

Immense import also is given to this truth by the statements of the Writings:

"Man is a heaven in least form." (A. C. 9594.)

"When Divine Order is represented in form it appears as a man." (A. C. 4839.)

"Heaven is represented and thus is described by the tabernacle; . . . for similar things occur with man in his internals and externals, and moreover, are presented in his body in material form." (A. C. 9632.) And in the same passage Swedenborg says that if these things had been known, the learned in the Christian world who had acquired any knowledge of the forms of the human body might have been in some intellectual light and hence in some idea concerning heaven itself. But (he adds), knowledge concerning heaven will be extinguished with all those who have not a distinct knowledge concerning three things; **FIRST.** The things which are in the human body. **SECOND.** The things which are of faith. **THIRD.** The celestial things which are of love, to which those others correspond. (A. C. 9632.)

Now this tabernacle of the heavens is the very tabernacle spread abroad in the heavens with its four apartments or atmospheres,—the Lord dwelling in use with man,—through which conjunction with man is effected. There is the inmost Holy,—the celestial, the Holy of Holies, the universal of all. There is the middle Holy,—the spiritual, the Holy place where the candles of God are alight and the stars shine. And there is the double court round about,—the natural heaven, which is two-fold always, a celestial-natural or internal, and a spiritual-natural or external. (A. C. 9741, A. E. 449.) The celestial-natural communicates with the celestial heaven directly, even as the inner court corresponds to the Holy of Holies directly. And in analogous manner, the spiritual-natural communicates with the spiritual heaven, even as the outer court with the Holy place. These are the rooms of the tabernacle of the Lord filling the great universe. In these He meets with His people and they with Him. These are the universal heavens, and the vortices and the many mansions which, as the **SPIRITUAL DIARY** declares, are filled by God-Messiah as Man. (S. D. 279.)

Now this doctrine of the tabernacle spread abroad in the heavens, presents that tabernacle as four great successive planes of the Divine as to use,—four great successive planes of



atmosphere or ether. And to it is joined the doctrine of man as a creature framed as to his interior constitution with planes answerable to each of those four planes or degrees of the Divine proceeding as atmosphere; that is, with as many planes of sensitive and motor faculties as are the number of the rooms of the tabernacle. These two great doctrines, which are one, are to be found in Swedenborg's works alone, and especially in his *ECONOMY OF THE ANIMAL KINGDOM*,—in the section on the human soul or internal,—and in his *RATIONAL PSYCHOLOGY*.

The study of Swedenborg's physiology, therefore, will cover the story of the four planes of the interior constitution of the human frame which constitutes a tabernacle "in little" answerable to this great tabernacle of the heavens,—this temple of the four atmospheres constituting the Divine Proceeding in substance and form and power. Thus in Swedenborg's physiology alone are to be found those knowledges of the human constitution from which, Swedenborg says, a knowledge of the heavens can alone be gathered; and respecting which, he adds, that if a man have not a knowledge of it, all knowledges concerning the heavens will be extinguished. (A. C. 9632 *fin.*)

We may all know from the Writings:

That the Word in its inmost is God, and in its integral form comprises a Divine celestial, a Divine spiritual, and a Divine natural. (T. C. R. 6.)

That the Word in its glory is the transfigured Lord. (T. C. R. 222.) And that when it was unfolded to its inmost, there, where the tabernacle stood, was the Lord alone. (T. C. R. 187 *fin.*)

Moreover, all things of the spiritual flow into a human form from head to heel. (A. E. 1208, 3-4.)

If this be true concerning the Word, and if the true knowledges of that human form internal be set forth in Swedenborg's earlier works alone, it becomes of great import to us to know whence he himself attains such truth, or by what means. In regard to the internal meaning of the Word we are told by Swedenborg that the Lord alone revealed it by illuminating his mind as he himself read the Word. (T. C. R. 779.)

In Swedenborg's *DREAMBOOK*, where the record is kept of his early experiences while engaged on the physiological works,

we find certain notable statements which closely parallel this statement just quoted. He states in regard to the ANIMAL KINGDOM, "That the Lord assisted him with it." This startles! Yet if it be true that the Word in its interior is the human form as to its interior constitution; and if God alone could unfold the truths of the Word; then perhaps also God alone could teach the interior constitution of that form as part of the Word. It would seem that it might indeed be worth God's while to instruct on this arcane subject, and Himself lead the thought of the man who was soon to unfold the Word, to true knowledges, to true perceptions concerning the interior of that human constitution which is one with the Word. I quote statements concerning Swedenborg's preparation and illustration by God while composing his physiological and philosophical works.

Swedenborg was in internal respiration and thereby in connection with the heavens in infancy during his prayers. Afterwards he was in this respiration while composing the philosophical and physiological works which he published. Moreover, intense interior reflection introduced and practiced this internal respiration. (S. D. 3464; see also 2 *Documents concerning Swedenborg*, 143-144.)

The Lord gave him dreams by which he was informed concerning the things he was writing. An extraordinary light appeared in the things which were written; and confirmatory flames were given to him by the Divine mercy directly. (S. D. 2951. See 2 *Doc.* 145.)

Another thing is apparent all through, as something inseparable from the radiant enlightenment, namely, the profound piety of the man, his personal relation with God, and his love, as of an absolute devotion, to God. We have the record of a form of consecration he made, "I give myself utterly away from myself to God." (2 *Doc.* 176.)

Along in 1744, in April, he says, that the Lord the Son of God came down with sound and with power so that he was thrown as it were from his bed, upon his face, and dared not lift up his eyes. But he prayed the Lord to make him worthy of this grace. And he felt the hand of the Lord strongly pressed his own, and he found himself lying on the bosom of the Lord, and he looked upon Him face to face, and he was given to know that so did He look upon His beloved disciples upon earth. Afterwards he fell into doubts and anxiety as to whether this were not a dream or a deception. And he was given to know that it



was evil for him to doubt, for it was verily true and not a dream. And that night it had been possible for him, because that night the Holy Spirit had purified him and encompassed him about and prepared him. Therefore he prayed at first that he might receive grace, and afterwards he was permitted and moved to add, that he might receive love, for to receive love is Jesus Christ's work alone and not man's. (2 *Doc.* 158-160.)

When he was led to the writing of the chapters on the skin, touch, taste and organic forms in the ANIMAL KINGDOM, something holy came to him and affected him. 2 *Doc.* 203.)

It was signified to Swedenborg that he should have the assistance of God in composing the work on the BRAIN. (2 *Doc.* 203.)

He dreamed of going into a ship where he sat down while another guided it. Two women were present and heavenly nectar was poured to him. It was signified to him that he received assistance from above, in the physiological works upon which he was employed,—and was employed merely as an instrument. (2 *Doc.* 205.)

And he wrote these chapters of the ANIMAL KINGDOM in a perfect state of illustration. (2 *Doc.* 206.)

He was not only enlightened, but he was sometimes checked in giving forth prematurely certain opening wonders of truth concerning the universal essence of the human body, the soul—which was as divinity, the Lord—in its universal microcosm, the human form. (2 *Doc.* 200-201, note.)

In the midst of all this concerning his intellectual work some things drop in which are significant. That we were to be as little children before the Lord both in spiritual and in worldly things, casting all our cares upon Him. (2 *Doc.* 201.)

Here comes a notable thing which is of special significance:

On the dawn of a Sunday morning Swedenborg saw the gable end of a most beautiful palace. In the society of wisdom of that palace it was resolved that he should become an immortal member of it, which no one before had been unless he had previously died, although there were now several so elected. (2 *Doc.* 207.)

The thought Swedenborg had in his heart was that this was not so important as that he should so live that he could be with God and God would look favorably upon what he had finished writing concerning organic forms in the ANIMAL KINGDOM. (*Ibid.*)

Afterwards someone told him he would visit him if he knew where he lived, and Swedenborg answered that he lived in the gable end of that palace. "This signifies (he says) that what I had written there with God's help was of such a nature that it would lead me on further, and that I would see still more glorious things." (2 *Doc.* 208.)

As we enter more deeply into the physiological works, and also into the theological truths of the Writings, and when we then perceive that the order of the interior constitution and activity of the human body is given one and the same in both, then will we in gladness recall Swedenborg's saying, that he was led to a knowledge of the verities of the human form by the very assistance of God. (2 *Doc.* 203.)

God alone is very man, and the inner verities of the man-form are such as they are because God-Man is such as He is. The universe was not framed from nothing, but from the loan of His own substance who alone is very substance and very Man. This He did that creation might be brought forth and creatures formed answerable in their activities to the Divine life, and blessed with its power and its life to the measure of their taking. This loan was the primal sacramental gift of His own substance that creation might be,—as if He gave of His own flesh to be the substance and bread of the world. Moreover, it is said in the SPIRITUAL DIARY that creation is possible because three successive Divine Essences proceed successively—all of which are Man: 1. Man in conatus or endeavor. 2. Man brought forth. And 3. Man Proceeding. (*S. D.* 4847.)

Further. The sum of the affections of the Divine Love weave a human form, and the Divine Love is the Divine Essence, the spiritual Sun,—the first given Substance, the Logos, the creative Word by whom and from whom God made all creation. (*S. D.* 4845-6.)

If the substance which was given that creatures might be brought forth was thus the substance of God-Man, no wonder therefore that to the human form, all things of the created world must strive! That growth and ascent and all evolution is human forever! (*Div. Love* viii.)

All creation moreover is organic, and before the Lord as one man. Everything which proceeds from the Lord as a Sun tends towards man, in least things and in greatest. (*Div. Love*, II-IV.)

Still another profoundest truth of religion,—a truth relating to the Trinity itself,—is one with the verity of the human form



given in Swedenborg's physiology alone. The first of finiting, the primes or simples of the Divine Love in creative outgo are named the Son from eternity, the Logos, the Word; and as to the relation of the Infinite Esse to these primes or simples,—this relation of Father to Son, as one God-Man,—Swedenborg says that it is as the relation of the human internal, (the human soul or spirituous fluid), to its body or fibre; and that the relation of these two in their outgo to and in the formation and operation of the whole ensuing human body, is as the relation of Father and Son in their outgo of the Spirit of Holiness to and in the creation flowing therefrom.

This study of the relation of the soul to its body or fibre in the human frame to which Swedenborg refers as the very parallel and correspondent of the relation of the Father and the Son in our Lord, is to be found set forth only in Swedenborg's own works on the *ECONOMY OF THE ANIMAL KINGDOM*, on the *RATIONAL PSYCHOLOGY* and on the *SIMPLE FIBRE*.

Again, in the Writings, it is said that man consists of three great provinces:

1. The soul which receives God immediately, that is, into which He inflows immediately, not by influx through the spiritual world, but from Himself alone. 2. The mind into which God flows through the whole of the spiritual world thus conditioned by it. 3. The body into which He flows mediately through the earth and the ultimates of creation. (*Intercourse of Soul and Body*, VI. *fin.*)

Now in Swedenborg's physiology alone do we find the study of the three universal essences or bloods of the human frame by which this threefold influx is operated. (*Animal Kingdom*, 509, 513; *Brain*, 89.)

1. The soul, the human formative, human spirituous fluid, by which is the influx of God immediately.

2. The animal spirit or intermediate fluid through which the influx of the spiritual world takes place. This intermediate fluid is held in correspondence with the marriage of love and wisdom in each individual man,—which marriage is conditioned by his individual relations to the spiritual world as embodied in his habits of volition and intelligence. (*A. K.* 509 *fin.*, and note z; *Div. Love and Wisdom*, 420-423.) This

blood presents both an arterial and a venous, or an influx and an afflux line.

3. The red blood which the Lord governs immediately through the food substances and the fluids which it carries.

All these things indicate that any real organic theology must recur continually to Swedenborg's earlier works, if it would livingly and really grasp the truth of the Writings themselves.

The great general subject to which we are now to address ourselves is then the study of the order of recipient forms. The definition of order as I use it here is that which is given in the *TRUE CHRISTIAN RELIGION*, n. 52. It is not the order ecclesiastical, nor the order social of which we hear so much, but an order which was in existence before churches were or men, and of which the organic forms of men are in their interior constitution a last full embodiment and forthstanding manifestation. "Order is the quality of the disposition, determination and activity of the parts, substances or entities which make the form of a thing." We have then to study the order of recipient forms, supremely of the architypal human form created in the image of God and able to be receptive to our Lord in that fulness of the Godhead bodily which in Him is,—a form which is to be receptive of Him more and more nearly to all eternity, and to be more and more nearly conjoined to Him.

#### SUMMARY.

God is Man. The sum of the affections of the Divine Love weave the human form. The Divine Proceeding from which all things are created is formed into successive planes called atmospheres or ethers, all of which tend towards the human form, and minister to the faculties of such a form forever. And to such a form all things in the world tend, even to the dust of the earth and its radio-emanations.

The Word in its glory is the transfigured Lord and the adoration, the love and the wisdom of the religion of the New Church is the Divine Human of God in its glory and its fulness.

Heaven is in its form a man before the Lord. It is represented and described in the tabernacle; therefore, similar things occur in the tabernacle as in man and nature. The



tabernacle has its four apartments,—the Holy of Holies, the Holy place, and the ultimate court which was twofold; and the four atmospheres are arranged, respectively, as those four apartments of the tabernacle.

Man also is an organic tabernacle of four planes of faculty, answerable part for part, degree for degree to the tabernacle in the heavens, so that God may meet with man and man with God in His great tabernacle of the Divine Proceeding. Therefore, Swedenborg was led to, and wondrously guided in his physiological works. "What I had written there (in the ANIMAL KINGDOM on organic forms) with God's help was of such a nature that it would lead me on still further and I should see still more glorious things." (2 *Doc.* 208.)

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In conclusion let me quote certain portions of the ANIMAL KINGDOM which outline the disposition of heart and mind in which all these studies are to be approached:

For the faculty of thinking distinctly, and for use and education, there is required: FIRST. An informing of the memory with images reproducing the forms and truths of the cosmos. SECOND. An assiduous awakening of our faculties, [that is, our inner organic forms], and a constant exercise of the gift itself until it becomes a part of our nature. And THIRD. Above all things "we must aim by education to become thoroughly imbued with the power of recalling the rational mind from the senses and the animus; in short, from cares, from lusts of the body, the allurements of the world, and thus, as it were, from our lower selves, while we are dwelling in its highest sphere. And this in order that the sensoria of the body may be deprived of their life, so long as the sensorium nearest to the soul is lightened and illuminated with its light. By these means we mount to our higher mind, or to the soul—which then becomes accessible and infuses power. For in proportion as we ascend upon these wings, in the same proportion that higher mind descends to meet us, and enfolds and embraces our wings in her winged sandals, and teaches us to convert our ideas into reasons, and reasons into analyses; for this is not a corporeal act, and therefore we cannot derive it from the senses, but from a power which flows into our sphere from the sphere above it. That this is no property of ours, but is made as it were ours, by a supernatural means of union,—of this we may be perfectly convinced." (A. K. 462.)

"If we wish to invite real truths, whether natural or moral or spiritual, (for they all make common cause by means of correspondences and

representations), into the sphere of our rational minds, it is necessary that we extinguish the impure fires of the body, and thereby our own delusive lights, and submit and allow our minds, unmolested by the influences of the body, to be illuminated by the rays of the spiritual power. Then for the first time truths flow in. For they all emanate from that power as from their peculiar fountain. Nor, when they are present, are there wanting a multitude of signs by which they attest themselves, namely, the very forms of sweetness and delight attendant upon truth attained and affecting the mind. . . . For as soon as ever a truth shines forth, such a mind exults and rejoices. In addition to these delights there are still more universal signs as the desire and passion for attaining truth, and the love of the truth attained not for the sake of our own advantage, but of the advantage of human society, and neither for the glory of ourselves or society, but of the Supreme Divinity alone. This is the only way to truths,—other things, as means which are infinite, God omnipotent provides.” (A. K. 463.)

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## THE FIBRE.

### CHAPTER XIV. (*Continued.*)

**244.** *Similar and still greater varieties occur in the NERVES. For all differences pertaining to the fibres produce variety in the fascicle, and all differences pertaining to the fascicles produce variety in the nerve, which is an aggregate of fascicles. There are now added varieties which are proper to the nerve itself, arising from the situation, nexus, size, and number of the fascicles, and also from the common tunic; which varieties are again as many as those recounted above in speaking of the fascicles. To these are added varieties of anastomoses, and of plexuses, reticular and gangliform. The number of the varieties is inexpressible; for it arises from every variety peculiar to the nerve, traced back to every variety peculiar to the fascicle, and this traced back to every variety peculiar to the fibre. And therefore, since there is so great variety in the nerves, so great in the fascicles and also in the fibres, there certainly results from the continual multiplication of these varieties, a quantity that is unassignable. Here we find something similar to what occurs in geometrical series, as when we wish to find out in how many ways the letters of a given word, or the num-*



bers in a given sum, can be transposed. *But the varieties in compound entities, and in the present case, the varieties in the nerves, are such that they can hardly be compared with the varieties in more simple entities. For each variety has its maximum and minimum. In compound entities, the degrees of varieties between the maximum and the minimum are fewer, and more slow, and uneven; but in simple entities they are more numerous, quick, and even or similar, and thus more harmonious and consentient, for they are applicable to each least moment or minute of mutation. Compound entities therefore, and in the present case, the nerves, are more imperfect and more liable to essential changes whence arises destruction; and unless they were constantly determined by simple entities, and brought back and restored to their natural state as often as they fall therefrom, these changes would at once destroy and utterly break up their essence and harmony. In respect to the perfection of more simple entities relatively to compound entities see Transaction I., n. 614, 615, 616. From this it follows that the most simple fibril, that, namely, which constructs that little canal which is properly called fibre, is the most perfect of all; after which comes the above mentioned channelled fibre; then the fascicle of fibres; and lastly the nerve, which, in itself, is rather to be deemed imperfect. But the most simple fibril which flows into the compound fibre, determines, and rules that fibre, and restores it to its natural state as often as it falls away therefrom; and in like manner does the compound fibre act in respect to the fascicle, and this in respect to the nerve. But as to the manner in which the blood vessels concur to the preservation and restorations of the nervous structure, the present is not the place to treat of this subject, for we have not yet treated of the origin of these vessels as being from the fibres.*

245. *In the whole system, there is not a single fibre, still less any fascicle of fibres, and still less again any nerve, which in respect to all its accidents, is wholly similar to any other. Moreover, in the single subjects or individuals of the animal kingdom, they are so varied that there is not a fibre, fascicle or nerve in one which is absolutely similar or equal to that in*

another. Nay, if there were myriads of earths, and if in each earth, myriads of inhabitants were born every moment, yet, in this perverted state, there could never be a fibre of one exactly similar to that of another in respect to character, nexus, form, determination, anastomosis; that is to say, in respect to all essentials and accidents. This is confirmed by the marvellous variety which we find in individuals, in whom the single parts of each membrane are just as distinguishable from each other, as the individuals themselves are distinguishable by their outward appearance. For we are born, not only into the mingled form of both our parents, but also into their animus and habits. The animus of the mother is changed time without number in the space of a few days or hours; and a similar change flows into the fibrous and nervous system, wherefrom the form and the imaginative force of the pregnant woman is derived into the body of the embryo, which is marked in due conformity thereto. Confer Transaction I., n. 267. To these also are added changes arising from constant variations in our own animuses.

**246.** The first cause of all changes and varieties in the nervous system, and in the external and internal forms arising therefrom, is derived from the diversity of ideas and principles existing in our minds, which determine the most simple fibril, and induce upon it a change of state. Another or secondary cause arises from the variation of animuses or affections, which so inscribe themselves on the countenance that they are plainly apparent. For their influx into the animal spirit and its fibre is so efficacious, that I would venture to say that in the animus, there is not a single motion repugnant to the natural motion of the body and mind, which does not carry to the fibres and least vessels, some force, and consequently some variation; such affections, for instance, as anger, envy, fear, sadness, etc. The third or last cause arises from a change in the blood, whence come sicknesses and diseases of the body. For the red blood is the treasure-house and seminary of all things in its body, and, after resolution into its elements, it runs through the whole structure of the nerve. See above, n. 200 seq. Therefore the whole nervous system is affected ac-



cording to the state of the blood, and this to such an extent, that by reason of bad blood fibre is dissociated from fibre and fascicle from fascicle, beds are loosened up, connections broken, passages hollowed out, and spurious plexuses and ganglia raised up; or, on the other hand, fibres, fascicles, and tunics are agglutinated, passages stopped up, distinctions obliterated, tumors formed, and structures eaten away, cut off and destroyed; as is abundantly learned from the several diseases, of which there is an host, and from an examination of dead bodies.

247. But vitiation of the blood does not extend to the simplest fibres, which remain in their integrity, entirely immune and free from all essential change, whatsoever the assault made by diseases of the body. Nor does this fibre suffer aught except from the desires of ends in the mind, those, namely, which are repugnant to the order of nature.

248. Moreover, the fibres and their fascicles and nerves are changed by time. For in first infancy they are in the utmost integrity, soft, almost fluid, obedient to the laws of their nature, and unanimous. Principles do not then wage war with affections, nor affections with effects; for then is the time of the Golden Age, and the kingdom is ruled by Astræa.\* But as we decline through our periods even to old age, the fibres and their fascicles and nerves, grow obsolete, become hard, resistant, disobedient to nature, discordant. Principles then wage war with affections, and affections with effects. Then is the time of the Iron Age, and the kingdom is ruled by the Fates,† together with the rest of the Plutonian crew. Thus we grow weaker every moment, and are snatched away to death.

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\*Astræa was the Goddess of Justice, and is represented as holding a pair of scales in one hand and a sword in the other. She lived upon the earth during the Golden Age, which is, therefore, often called the Age of Astræa; but in the Ages of Brass and Iron she was driven to heaven by the wickedness and impiety of mankind.

†The Fates, Latin, *Eumenides*, Greek, *Erinnys*. Our author uses the Greek word. The Fates were the three daughters of Pluto, who were employed in inflicting the vengeance of the gods upon the wickedness of men. On earth, this was done by wars, pestilence, and dissensions, and in hell, by continual torments.

## CHAPTER XV.

## THE SIMPLE FIBRE.

249. *The fibre of which we have hitherto treated is not the most simple of all; for it is a little passage or canal for that subtle fluid which is called the animal spirit; and it is girt about with the most delicate membranes or the softest meninges. That this fibrè is girt about with a certain most delicate meninx, or that it is a subtle membrane,—since it is a little canal, transmits spirit, and is distinguished from the neighboring canals. See above, n. 209. That this tunicle is the most simple of all the tunics of the body, and consists of little fibres pure above all imagination, see n. 210; and that this tunicle is double, n. 219. For in order to the existence of a little canal which shall be distinct from other canals and shall transmit spirit, there must of course be a surface or tunicle. This tunicle ought certainly to consist of those fibrils which we call the most simple. The same thing moreover is taught and confirmed by the cortical gland from which the fibre is produced. For according to the description, this gland, like a little heart, is furnished with a minute ventricle or follicle and also with a certain superficial materia which constitutes the body of the gland. Confer Transaction II, n. 124-126, 132, seq. This follicle and also the superficial structure is continued into the fibre and through the fibre. For the fibre is the continuation of the cortical spherule, like as the artery is a continuation of the heart. Hence this glandular or cortical surface must necessarily consist of fibrils the most delicate of all, co-ordinated together in the most exact manner.*

250. *In the subjects of the animal kingdom this simplest fibre is deservedly to be called the first, supreme, inmost, most remote, most universal and most perfect fibre, yea, the one only continuous substance from which all other continuous substances, howsoever many they be, derive their existence, subsistence, nature and faculty of action. I make a distinction between continuous and contiguous substances; or, what is the same thing, between coherent and fluid substances. For con-*



tinuous and coherent substances constitute tunics, while contiguous or fluid substance permeate the little canal formed by the tunic. For example, the tunic of the artery is a continuous or coherent substance, while the blood is a contiguous, or fluid substance. It is called contiguous, because the parts are merely contiguous to each other, and after the contact are just as easily separated as if they had never been contiguous. Continuous parts are indeed also contiguous, but this at many points, and, therefore, they cohere. *So that to this fibre can be applied the philosophical canon: That in the animal system, in that it is animal, there is nothing that is truly substantial except this fibre, and that the rest of the compositions consist of mere accidents.*

251. *Moreover it is proper to predicate of this fibre that it is the pathway of the determinations of the soul, and, as it were, the ray of its intellectual light, and the veriest force of forces and form of forms in its kingdom. From which predicates it follows that animal nature herself and the state and condition thereof depends principally upon this fibre. For this fibre is the nourishing parent of both the cortical and the medullary substance, and in the body it carries every point. These positions will come to be better explained in what follows.*

252. *But the nature of this fibre cannot be learned except by the analytical way, that is to say, by abundant experience drawn from things posterior and from phenomena investigated physically and philosophically all the way to their causes and principles; for it is utterly remote from the perception of the senses, and goes beyond the sphere of anatomy. Hence our primary concern is that we may come to a knowledge of the essence and nature of this fibril, for on this knowledge depends the understanding of the causes, and the inmost understanding of the phenomena in the whole of this noble kingdom. For even though we know all other things, still they are merely effects, and the entire product of those infinite forces which flow forth from the potencies and principles of this fibril; and thus we really understand nothing if we are ignorant of this fibril in respect to its quality.*

**253.** *In general it must be held that it is necessary that this fibril also be transpirable, be gifted with a pervious and most highly minute cavity, and thus be an image in least effigy of the larger or compound fibre; otherwise neither this fibril nor anything whatever in the animate body would own and bring into act any origin, progress, order, law, motor force, life and sensation; in that the fibril without a perfluent fluid or some analogue of a fluid would be a stamen impotent of action. And this for the same reasons as those adduced above. n. 142, 143, in respect to the medullary fibre.*

**254.** *That uttermost fluidity or fluid, so called by eminence, which runs through this fibril, can be no other than that first and pure essence, truly animal, and partaker of life, which is called the spirituous essence, and which is conceived in the inmost penetralia, vesicles, and fistulas,—also so called by eminence,—of the cortical glands, and is brought forth and transmitted in accordance with every need of nature. Confer Transaction II, n. 165-167. And since there is no other fibre that is more simple, it follows that this same essence forms that fibril's delicate tunicle or likeness of a tunicle. This essence or uttermost animal fluidity has been treated of in Transactions II, chapter III, [On the Human Soul, n. 208, seq.], and frequently elsewhere. Moreover, I shall also continue the thread later on. Meanwhile I think no one can deny that in the animal kingdom there is a certain essence or substance proper thereto,—just as there are essences and substances proper to the vegetable and mineral kingdoms,—which is the first, inmost, and most universal essence, and from which are all the rests. Unless we concede this to be the case no physical law nor any philosophical dogma could have any place in the animal kingdom. On the other hand, if we do concede it, the several particulars come into agreement, and all the phenomena are explicable in agreement with those particulars. An essence of this kind, most facile for the undergoing of accidental mutations, (respecting which see above, n. 241), for this is the perfection of superior entities,—cannot do ought else, than by a mode of constriction put on a nature less fluid according to all degrees; and the reverse also is true. For how can this be im-*



possible to the most perfect entities of nature, when the less perfect and the compound, that is to say, elastic bodies exhibit the same phenomenon? Thus nothing can be more easy to this essence than the building of a tunicle from itself, or, if I may so say, from its own materia.

(*To be continued.*)

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## THE SENSES.

TRANSLATED BY E. S. PRICE, A. M.

### *The Sense of Taste, or the Tongue.*

*Experience.* See Part I, ANIMAL KINGDOM, chap. I.

HEISTER on the Papillæ of the Tongue: The *envelopes* are three in number: The *outmost*, which is the continuous common membrane of the mouth, forms little sheaths, as it were, pyramidal and globular, and is porous for receiving the nervous papillæ of the third membrane. The *middle* is the reticular membrane of Malpighi, consisting of a delicate net, transmitting the nervous papillæ through its foramina, and visible in the superior part only; more difficult to be seen in men than in beasts. The *third*, or *papillary-nervous tunic*, found also only in the same place as the middle, contains the nervous papillæ of diverse figure, for the most part, however, *fungiform*, either headed like the horns of snails or like fungi: these, furnished with little foramina, can be pushed forth and withdrawn. Then there are the *pyramidales*, larger and smaller, sometimes bent; and where these papillæ arise from this outmost tunic and the nerves of the tongue, they pass through the little foramina of the reticular tunic, and are terminated in the little sheaths of the exterior tunic, and constitute the primary organ of taste.

WINSLOW. Papillæ of three kinds are distributed over the upper surface of the tongue; namely, the headed papillæ, with little heads like those of fungi, superimposed upon a slender neck or short stalk; these are found everywhere over the base of the tongue in little fossæ or superficial crypts. They

are like little conglomerate glands, sitting upon a narrow base, and a little hollowed out about their middle convexity. They occupy the whole surface of the base of the tongue; the blind foramen is filled with these glands. The *lenticular* bodies are little orbicular eminences, rather flatly convex, the circular border of which is contiguous to the surface of the tongue. Through the microscope the whole convexity of the tongue appears to be pierced with small foramina or pores, just like the rose of a watering pot; they easily lose their consistency, so that when they are rubbed, they suffer themselves to be put forth into the forms of soft pyramids, and to be depressed at the sides. The *serico-villous* papillæ are the smallest and most numerous of all, and they occupy the whole superior surface of the tongue, indeed the intervals themselves of the rest of the papillæ; they are to be called rather conical than villous papillæ, for they are represented as such by the microscope; they are naturally rather soft, and after death they become flaccid, to the degree that they are somewhat more long and slender than in the natural state; on rubbing them between the fingers they are shortened and become thick. The reticular membrane in the boiled tongues of oxen, indeed in human tongues, is a kind of mucilaginous and clear substance between the papillary membrane and the external, or epidermis, scattered and sparse; this material becomes white by boiling; the foramina there are caused [by the pyramidal papillæ].

MALPIGHI: There are bodies breaking forth from the outmost surface of the tongue, and in the direction of the posterior pole, slightly curved, arranged in a series, resembling a carding comb; these prominences are cartilaginous in the ox, in the form of a boar's tooth; they exhibit a concavity at the root; they are composed of a dense and tenacious material; about the sides of the tongue they grow so slender that they are almost obliterated; in the base of the tongue instead of the membranous tunic are found bodies which are almost like a somewhat blunt conical teat; the single bodies are invested by the membrane of the exterior of the tongue. In the tongue of the fish they are bony at the apex, conical and blunt; these horns are found in the base of the tongue; they are evidently



hollow; nevertheless their substance becomes so slender and is so dilated at the middle, that it not only gives place to the subentering nervous papilla, but also appears diaphanous; they are implanted in a kind of mucous body; very minute pores and meatuses are observed, especially at the roots of the horns; under this they present a glutinous substance, white outwardly, black beneath; it is stretched after the manner of a membrane or rather coarse net; they present themselves to the nervous papillæ, especially at the sides of the tip of the tongue; like the horns of snails they enjoy a somewhat tall stalk with a little round head; they originate from the nervous and papillary bodies; in the base they have a nervous offshoot to which they are appended or rather attached; the papillæ of the second order are more numerous; as many as are the horns without, so many are the papillæ within; arising from a common body of the papillary substance they are elevated into a middle altitude, and from their extreme head they send forth nervous shoots still further, which enter the sinuses below and run to meet the roots of the horns; about them are seen innumerable papillæ, allotted to the same origin, and elevated to the same altitude, yet more slender, which are given the figure of a cone; when excited, entering their own sinuses beneath in a mucous substance; finally they terminate in the outmost membrane; similarly in the palate it clings closely to certain nervous offshoots, of which the whole mass of fibres is woven, and many offshoots springing from the trunk of the nerves end in this nervous body; hence its origin must be considered to be derived from them, since in the rest of the sensories, the nerves are extended into the membrane, for the most part as an ultimate aid.

SWAMMERDAM. In the house snail (slug) they are represented like sawtoothed combs; in the cuttle fish and in fishes, through the microscope a kind of little bone is seen, fortified with more than sixty papillæ, curved backward, dentiform and cartilaginous.

BOERHAAVE. In the inmost subtilely cellular, somewhat fatty membrane, almost as in the skin through a pierced body, the papillæ are pushed up in little erect sheaths of the exterior membrane; they are protected by these sheaths against

asperity, etc.; these sheaths are porous, and so upstanding, that the pressure of food and drink may rush upon them with force.

BIDLOO shows cartilaginous bodies of a dental form, some of them double headed.

*The Sense of Taste, in General and in Particular.*

From the use we may judge of structures; the uses of the sensations to the rest are well known, because they declare themselves every moment, and the life of the body is in them. Let us explain the successive series of uses, let us examine the degrees of the series, let us unfold the parts of the degrees, and let us confirm each part by experience; thus we shall proceed in order and follow nature who shall introduce us through the senses into her secret recesses, especially if we know how to consult rightly the mistress of the senses, that is, the understanding. So long as we live in sense, we live as animals; only a superior faculty, that is, the human mind knows how to obey passively, and to add something which will confirm the fallacies of the series; thus the senses themselves deceive their own understanding, and render the rationality irrational; but the higher we elevate ourselves above the senses and to a superior sphere of understanding, whence the understanding learns to act understandingly, the more we become neighbors to a higher, spiritual, divine power; the more we become men, the vicarious divinities of the earth; the more we shall behold naked truths, constancies,\* felicities which the senses do not know, and which they extinguish. We have been long in this state; the ages have rushed into these things; at this day we know but little beyond the senses, and we live in the body or on the surface. Let us elevate ourselves to higher things, and to the truths of things themselves, which are invisible; but still more true than the visible, because they are not fallacious and inconstant; thus we approach nearer to spiritual essence to the truly human to a more perfect state; we are unwillingly to believe that this is impossible, or still to be closed\* to the senses through the ages; these are the arguments which

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\*Words marked with asterisk indicate a doubtful reading of the MS.



animal and corporeal men desire. Corporeal ambition aspires that no one shall ascend above it. Let the [all] seeing fates so bear us on that we shall return to the silver and golden ages; and, with our mind as a leader, let us strive to struggle out by the analytical way; in that event the divinity is with us, whose principal essence is wisdom and charity; but let us not therefore desert effects, for we ought to strive by means of them.

1. Wherefore the uses are: 1. That the sense may perceive what lies hidden in the foods which are taken, whether they are suitable for the blood, whether they ought to be turned into chyle, whether they ought to be committed to the stomach and the chyle and blood-making viscera; wherefore, that it may perceive what will serve the corporeal life, and be homogeneous with it; wherefore, the tongue is prefixed to the abdominal viscera, and that sense is for the nutrition of the corporeal life. 2. That that sense may affect the animus and the body itself, and thus excite the appetite, and continue the desire for food, or even that it may affect in a contrary manner, that it may reject things taken, and may extinguish the appetite; wherefore, that it may desire a thing if it be good, may turn aside and reject it if it be evil; whether a thing be truly good, or truly evil for the body, is not given man to know by nature, but by art, although there are indications in the appetite itself for what is taken, which precede in man; it is otherwise in brutes. 3. That according to the affection of the sense and the appetite thence arising, the state of the little sensories and of that organ may be changed; then also the state of the stomach itself and of all the viscera dedicated to nutrition. 4. Finally that effects according to the change of state may come into existence, that the media may be excited, that the salivary pores may be opened, that the papillæ may be extended, that all things may be arranged for nutrition; these media themselves then produce the effect; they are innumerable and extend throughout the whole body.

Therefore, the rule is: affection according to sensation, change of state according to affection, effect according to change of state. But let us proceed to the particulars.

2. Now as to the first use, *that the sense may perceive what*

*lies hidden in the foods which are taken, whether they are suitable for the chyle, the blood and the viscera, or whether those things are homogeneous which touch this barrier and gate,* these things are to be observed: 1. We must consider the quality of the foods which are taken, especially those parts which excite the sense; 2. the quality of the little sensories which correspond and apperceive; 3. how that which touches and creates taste is brought near, or how it is dissolved, brought near, touches and imprints an image of itself.

Wherefore, we must consider the objects of taste themselves, and the media and aids.

3. As to the quality of the objects or foods it is to be observed: 1. They are the dissolved parts floating in water, the salivary menstruum which resolves similar things to their unities. 2. Those parts are diversely figured, they are angulate, flat, circular and diversely spherical, of infinite variety; nature herself produces this variety in the mineral kingdom, where the forms are quite simple; they are compounded and formed in infinite modes in the vegetable kingdom; finally they are taken and formed otherwise in the animal kingdom; thus it is the parts of a three-fold kingdom which affect the little sensories of taste, that is, the tongue; 3. there are parts hard and heavy, heavier elements, salts, not soft, yielding, elastic; for they do not affect the tongue; some of the dissolved parts break forth as oils and spirits, some while they yield put forth their spicules or planes; thus they are all parts of the angular form which are hard both outwardly and inwardly; this will come to be demonstrated in the doctrine of forms. 4. It is only their external surfaces which affect, whence what kind of figures they have is evident to the sense itself, that is to say, whether they can be accommodated to the chyle. 5. The maximum of that sense seems to be common salt, with its eight acids or spicules, for the tongue perceives it floating in water; many things taken at once are not so sensed unless they be dissolved; we can know what of all things belongs to that sense; if only we take a particle of water, one particle of salt fills up the eight interstices of water; this has been shown elsewhere. 6. That which exceeds the maximum has reference to the sense of touch which is also in the tongue, for the tongue possesses both



the sense of taste and the sense of touch; thus there is a further dimension, which is the affection of touch. 7. The maximum of this sense, that is, touch, seems to be the smallest apex of that same common salt, for it is sharp with minute flat surfaces; when these apexes are broken they produce the acid of salt, or even that of nitre; the apex itself is scarcely sensed, but because like a concave trigon it increases in dimension, therefore while it forces itself in, it also forces in its broader part, and many apexes at the same time; therefore sensation arises. 8. That which is smaller than this apex, removes itself from the sensation of taste, and has reference to the sensation of smelling, while it floats in the air, or is transferred thither [*i. e.*, to the nose] by water, as the more volatile spirit of liquors when drawn to the nose; the coarser and compound parts of it affect only the taste and under the phenomenon of heat or of something else, as experience evinces. 9. From the above it is apparent whence is taste; that parts figured in this manner are produced in infinite variety, that is, parallelograms, trapezia, polygons pointed in a thousand modes, circular according to diverse curves, and at the same time blunt, pointed, at the same time flat-sided, etc.; geometry can enter into only the generals, scarcely into the particulars, still less into the parts themselves. 10. From one object known as to its quality, and from the sense thence arising explored, it can be known by the sense alone what are the figures of the parts which touch and produce it; an irregular polygon is bitter; one regularly pointed is salt; a regular polygon is acridly sweet; that below the measure of the smallest, which with its apexes is not adequate to the faculty of the organ which it titillates, like touch, if it be touched very lightly, nor is it round, which is sweet, unless it be at the same time very finely and regularly pointed,—this soothes; thence is sweetness, which is titillation, and many other things which can be deduced from these considerations. 11. The soul in which is animal nature, and thereby the organic causes in which there is a corresponding nature, knows most exquisitely from its own sense of taste, what is suitable; it discriminates this from the rest, and applies it to itself; for it knows this to be homogeneous with the chyle, or heterogeneous thereto. 12. But art and science do not come so far,

for no one yet wishes to explore the figures and forms of parts, and without a knowledge of them, we never arrive at any science but [only] at its first threshold; for the sake of those things which are hidden from the senses, there is given a sense which mediately instructs the soul as to what is brought in; for the soul residing in a superior sphere of the world, cannot know what is done in spheres below it except mediately, that is, by a mediating organism, which it has constructed. 13. But this sense of taste does not arise from a single part, which touches its organ, but from many, therefore there are many various parts, which touch the various papillæ; thence results sense; thus it is not the form of a single part, but the forms of many parts which produce taste; the soul from the difference of taste exquisitely and distinctly perceives all that variety, and how the parts agree with its chyle.

Of what quality truly are the little sensories of taste? They are: 1. Conical papillæ, or the pyramidal, but not the fungiform headed glands, for these are the primitive tasters of the chyle, and inhibit the juice by castigation; see the TONGUE. 2. These papillæ are infinite in number, being inserted in the interstices of the glands, so that nowhere can a place be touched where they are not present. They are arranged in a beautiful order, especially at the tip and at the sides of the tongue, where the food dissolved by the salivas first washes them. 3. They are also present in the root of the tongue, indeed also in the palate, but there they are coarser, where they perceive the coarser parts. 4. Wherefore there is infinite variety in this papilla, to the extent that there is not one absolutely like another. 5. They are arranged in such an order that they can produce communication; for such as is the form of each papilla, such is that of the papillæ among each other; the very form requires that the quality of the sense shall be in it, and that all things shall be rightly accomplished according to the order of nature. 6. The papillæ of the other senses are also similar, as those of smell and touch, but otherwise arranged, clothed and congregated; thus there is a likeness between these senses, for all of them receive objects of angular form, but in various manner according to the organism particular and general, and according to many contingencies. 7. They are similar



in the œsophagus, stomach and intestines, that is to say, the serico-villous or conical, and, as it were, capillary papillæ. 8. They are conical, that is, somewhat broad at the base, terminating in a point; 9. whence they are most suitable for taking on every change of form, and for applying themselves to all points of a corpuscle in contact; for the conical form can turn itself in the direction of all curves, while it undergoes changes of state. 10. Those papillæ are furnished with a sheath, lest being naked they should sustain the first impacts; for then they would be lacerated by the somewhat hard and at first very coarse elements; besides, the sheath is for protection against heat and cold. 11. That sheath consists of the ultimate branchlets or capillary arteries, wherefore it is a passive membrane, which accommodates itself to the included actives; for most of the membranes are woven from arterial thrums, as has been shown in my works, and as will appear evidently, in the work on the Brain. 12. These sheaths also are various, and entirely accommodated to the variety of the included papillæ. 13. Wherefore they announce beforehand to the papillæ what is coming; by a certain subtile sense of touch, or by a blunt taste they teach what ought to be insinuated and admitted, as do the lips what ought to be poured into the mouth and over the tongue; according to those indications, the papillæ adapt themselves, close or open their foramina, and enter into their sense and its potency. 14. There are also present somewhat hard, that is, cartilaginous membranes, which cover them like horns or scales, for they lie hidden under the latter, and by them they are continued through the membranes; see Malpighi. 15. For thus the sense is exalted, for every sense increases by the adjunction of bones or cartilages, as in the periosteum and the single sensories, the reason is that a tremor is brought in, thence the sense is exalted, terminated and diffused, and such a membrane gives the force for diffusing the sense.

How is that which touches the sensory brought to it? 1. It is brought by water which dissolves the saline parts; by the oily and spirituous parts [of the saliva] which dissolves the fats and sulphureous parts; such things exist in liquids of various kinds; [the saliva] dissolves the menstrua, which

again dissolve the first connections, indeed sometimes to the maximum and medium degree of the sensation, whence are appetized so many kinds of drinks, wines, liquors, waters, meads and foods; for the dissolved foods themselves furnish their own menstrea. 2. These, because they are fluid, convey with them as vehicles and apply the dissolved parts especially to the sheaths, in order that on the first sense of touch the papilla may notice how it shall apply itself; for infinite things are done in purest nature of which we take no cognizance, but still the very tissue argues that such is the connection of things. 3. These parts the saliva itself still further dissolves, which saliva is the solvent menstruum of both saline and oily matters, and also of sulphureous matters of most various kinds. 4. The saliva, since it consists also of parts of the animal kingdom, and of spirits and very many other things, not only dissolves but also infolds, especially the pointed parts, in order that they shall no longer be so hurtful; it responds to their state and turns them into what is homogeneous, so that it may be applied to the papillæ. 5. Therefore the saliva still further finishes, dissolves and infolds the thing, takes away its power of hurting and adapts it that it may be suitable for the chyle; wherefore it is of so great variety and springs from so many little fountains. 6. After the saliva has adapted the parts, it then insinuates them, that they may touch the papillæ, and that the papillæ may perceive whether they are suitable; wherefore those sheaths are porous, especially about the roots of the horns; see Heister and Malpighi. 7. The horns themselves also introduce things, for they stand along the sides and are turned towards the foramina, that things may enter. 8. Then also that they may be ejected thence into the foramina, there are those which reject on the swelling of the papillæ. 9. The papilla applies itself to the little foramina, nor does it admit [anything]; but after the sensation it repels [what approaches], in order that it may be insinuated into the glands, or taken away into the pharynx and œsophagus. 10. The saliva is made altogether for dissolving and applying those things which ought to enter, for it looks out in the first place for the chyle which cannot be inaugurated without the accompanying saliva.

*(To be concluded.)*



# THE NEW PHILOSOPHY.

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## Editorial Notes

We are pleased to announce that the new translation of Swedenborg's work on *GENERATION* is now out, and has already been distributed to subscribers. Non-subscribers may obtain copies from the publishers, Messrs. Boericke & Tafel, whose advertisement is printed on the last cover page of our present issue. It will be of interest to our readers to learn that plates of the work have been made, so that there is little danger of the book again becoming out of print.

In a widespread communication addressed to various bodies and individuals, Mr. Alfred H. Stroh earnestly advocates that all editions of Swedenborg in the original language, be made of uniform size, and that plates be prepared for a future edition of the *OPERA OMNIA*. With this proposition we are heartily in favor, and we note with gratification the generous offer made by the *ACADEMY OF THE NEW CHURCH* to "co-operate with any other body or bodies in the preparation of plates of Swedenborg's works in the original such as are now being published by the Royal Academy of Sciences in Stockholm," to the extent of contributing "one-half toward the expense." (See *Transactions*, § 21.)

### THE WORK ON THE SENSES.

The present installment of the work on the *SENSES* completes that work so far as is at present contemplated. There still remain two earlier works that belong to this series,—one on the Ear, and the other on the Eye. These, however, are

not necessary to complete the work on the Five Senses, and will not be included in the volume,—unless present plans are changed. This volume, which is waiting only an Introduction and an Index to be prepared by the translator, will comprise Swedenborg's first draft of his treatment of Smell, Hearing, Sight,—followed by an Epilogue on Sensation in General, Affection, and the Understanding and its Operation,—Touch and Taste. The parts on Touch and Taste have been elaborated by the author himself, who published them as part III. of the ANIMAL KINGDOM; but the rest of the work is wholly new, and will furnish an important addition to the list of Swedenborg's scientific works, and one of which our Association may well be proud.

As to the parts which Swedenborg elaborated and published, the translator, at the recent meeting of the SWEDENBORG SCIENTIFIC ASSOCIATION, expressed it as his opinion that their only use was "to form a symmetrical whole of Swedenborg's draft of the work on the SENSES." (See Transactions, § 8.) We mention this for the purpose of calling attention to our divergence from this view, as may be seen in the January issue of the NEW PHILOSOPHY, p. 3.

The portions on the Ear and Eye, referred to above, and which have been photolithographed, are not drafts, but are more or less finished treatises written in the style of the ECONOMY OF THE ANIMAL KINGDOM. For this reason they do not, strictly speaking, come within the scope of the volume translated by Mr. Price, which comprises only drafts intended for the later series, termed the ANIMAL KINGDOM. (See Preface to recent edition of the work on GENERATION.) They evidently constitute an earlier treatise written on a different plan than the later drafts. Still it would be of manifest advantage to incorporate them in the forthcoming work on the SENSES. The transcript from the photolithographed MS. has already been made, and there remains only the translation. We do not, however, think it advisable to delay the appearance of the work on the SENSES in book form, by printing these parts on the Ear and Eye in the NEW PHILOSOPHY,—which would occasion a delay of at least a year. The only way, therefore, in



which these parts can be included in the work on the SENSES would be by private subscription to defray the cost of printing. Whether this will be forthcoming remains with our readers.

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THE NEW EDITION OF THE "PRINCIPIA."

As will be seen from the Transactions published in our present issue, the long expected edition of the PRINCIPIA has at last been published by the London Swedenborg Society. Besides the PRINCIPIA proper the work,—which is contained in two volumes,—also includes the first translation of the LESSER PRINCIPIA,—here called the "Minor Principia,"—Swedenborg's SUMMARY OF THE PRINCIPIA, and his ARGUMENTS FOR THE PRINCIPIA. The price of the two volumes is, we believe, \$6.50 plus \$1.00 for customs duty.

At its recent annual meeting the SWEDENBORG SCIENTIFIC ASSOCIATION extended to the SWEDENBORG SOCIETY its heartiest congratulations at the completion of this great work, and in these congratulations every student of Swedenborg's science will undoubtedly join.

But there was also a strong note of adverse criticism. For considerable indignation was expressed at the inclusion in this edition of the PRINCIPIA of certain observations introduced in an Appendix by Professor Very, which, in effect, characterized the teachings of the PRINCIPIA as obsolete, though still to be admired as a bold attempt to solve a difficult problem. "His hypothesis (says Prof. Very) may have to be modified so as to be scarcely recognizable. Some of them must be abandoned entirely; but nothing can dim the glory of this magnificent dash into the unknown. It will stand alongside of the sublime poem of Lucretius, which no one accepts as a true picture of the cosmos, but which will remain as one of the monuments of a heroic struggle of the philosophic intellect to reach freedom."

The same kind of criticism is even more baldly stated in the Foreword, by Sir W. F. Barrett, where the first—and the vital—part of the PRINCIPIA, while admired as "a first daring adventure into the unknown," is yet characterized as being

certain to "repel, or excite a smile in the scientific reader." Even the Introduction by the Rev. Isaiah Tansley, while devoted to adducing from modern science confirmations of Swedenborg's doctrine, is not entirely free from this unfortunate blemish of negative criticism. We read, for instance, that "Swedenborg fails . . . to provide for the formation of a definite concept, yet he makes a bold attempt to account for the derivation of the finite from the infinite." "He is sometimes lost in the maze of his own theories." He "was not always clear and accurate" and "while some of his deductions touch modern science at many points, others are questionable in the light of rigid scientific proof."

The general effect of such negative criticisms is the production of the impression that the *PRINCIPIA* is a work of merely historical interest whose doctrines are of importance, not as teaching anything unknown to the modern world, but only so far as they anticipate what modern science has already discovered independently.

It is not that there is any objection to scholars holding such an opinion, or publicly expressing it. This is obviously legitimate. But to incorporate negative criticisms in the work itself,—the work of a master mind,—this is indeed deplorable. And the more so in that the criticisms are made from the standpoint of an agnostic science which is confessedly in darkness respecting the very subject with which the *PRINCIPIA* deals; a science, moreover, which has been forced in some respects, to more or less obscurely broach theories which are clearly set forth by Swedenborg as truths of the reason enlightened by the acknowledgment of a divine wisdom creating.

We do not wish to be understood as meaning that the *PRINCIPIA* contains no errors; nor would we object to mathematical corrections like those included in Professor Very's Appendix, where such are obvious. But we do hold that Swedenborg's scientific works occupy a unique position as setting forth the means, that is, the philosophy, whereby their author was prepared to receive in his understanding and publish to the world the revelation contained in his theological writings. This should be obvious to all Newchurchmen,—



and it is Newchurchmen who are responsible for this edition of the *PRINCIPIA*.

The scientific works are invaluable and even essential for a fuller comprehension of the theological. In the past they have been largely neglected, or misunderstood, and now that a beginning, (and it is only a beginning), is being made of their study, a glimmering being had of their wonderful Philosophy, of their service to the theological writings, it would, to say the least, be only the part of modesty for editors to refrain from negative criticism,—criticism, moreover, with which many profound students of Swedenborg emphatically disagree—and to allow the great philosopher, at least in his own works, to speak for himself without the warnings and cautions of lesser minds.

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## TRANSACTIONS

OF THE

### FIFTEENTH ANNUAL MEETING

OF THE

### SWEDENBORG SCIENTIFIC ASSOCIATION.

The Fifteenth Annual Meeting of the Swedenborg Scientific Association was held in the Parkway Building, in the City of Philadelphia, on Thursday, May 16, 1912, at 2 P. M., Dr. Frank Sewall presiding.

1. The minutes of the Fourteenth Annual Meeting as printed in the *NEW PHILOSOPHY* for July, 1911, were accepted and approved.

2. The Chair appointed Mr. E. F. Stroh and the Rev. Louis F. Hite a Committee on the Roll. The Committee reported that there were twenty-nine members and twenty-seven visitors present.

3. The following statistical report of the membership of the Association and of the subscribers to the *NEW PHILOSOPHY* for the years 1905 to 1912 was presented:

Membership . . . . .	05	06	07	08	09	10	11	12
New . . . . .	8	5	12	48	4	15	4	6
Resigned . . . . .	6	6	8	8	11	2	9	9
Lapsed . . . . .	18	4	3	4	6	—	12	10
Died . . . . .	3	—	3	3	1	3	3	4
Net . . . . .	174	170	169	202	188	198	178	180

#### Subscribers to New Philosophy.

New . . . . .	—	9	17	61	6	23	15	8
Discontinued . . . .	—	17	20	20	26	11	33	31
Net . . . . .	217	209	206	247	227	239	219	190

4. The BOARD OF DIRECTORS in its report recommended that the Association make some suitable expression of appreciation of the appearance of the new translation of Swedenborg's *PRINCIPIA*. The Board also suggested that the meeting consider by what means interest in the Association might be increased. The Directors were agreed that if there was sufficient demand for it, it might be well to hold some meetings in connection with the meetings of the General Convention.

5. The TREASURER presented his financial report. (See p. 89.)

6. On motion the Treasurer's statement was received and the Chair instructed to appoint a Committee of two Auditors. The Chair appointed Messrs. C. E. Doering and W. H. Alden.

7. The EDITOR OF THE NEW PHILOSOPHY reported that, excluding the Transactions of the last annual meeting, the NEW PHILOSOPHY had averaged thirty-four pages an issue. Speaking of the recent commencement of the series of articles by Miss Beekman, he noted that this was in pursuance of the policy outlined by him in his inaugural editorial in July, 1909. But since that time only one article had been offered to him for publication. The work on the Senses would be completed in the next issue of NEW PHILOSOPHY, and when the index, on which MR. PRICE was now working, was ready the whole work would be issued in book form. The work on the Fibre was almost half completed. One hundred copies of the President's annual address at the last meeting had been issued in pamphlet form for distribution by the president.



8. THE REV. E. S. PRICE, translator of *DE SENSIBUS*, reported the completion of the work. He greatly regretted that the two chapters not included by Dr. Tafel in his Latin edition, but which had been translated by the speaker from a transcript of the Photolithograph, had not been taken up in time for insertion in their proper place in the book, but must come in the form of an appendix. The only use he saw for these chapters was to form a symmetrical whole of Swedenborg's draft of the work on the Senses, and this they will not do when printed as an appendix. The chapters themselves were elaborated and published by the author, and if these first drafts have any further use than that already mentioned it was as a study of Swedenborg's method of work, for they add nothing new to what the author himself published.

Mr. Price gratefully acknowledged the services of the Rev. E. E. Iungerich in translating from the photolithographed MS. the two chapters in question, and the services of the Rev. Alfred Acton for assistance in the way of much valuable criticism.

9. MR. ACTON, the Chairman of the Committee appointed to investigate the transcripts of Swedenborg's MSS. in possession of the Association, with a view to their possible publication, reported that the committee had only recently received from Sweden the bulk of the material needed to complete its work, and that it was therefore not ready to make a final report. The committee requested to be continued.

10. A Report and Communication to the Association from MR. ALFRED H. STROH was read. (See p. 90.)

11. On motion the Chair was instructed to appoint a committee of three to nominate officers for the coming year. The Chair appointed Messrs. John Pitcairn, C. E. Doering and E. J. E. Schreck.

12. President Sewall delivered the ANNUAL ADDRESS on "The Swedenborg Scientific Association; Its Aim and Its Achievements." (See p. 93.)

In voicing the appreciation of the meeting MR. ACTON emphasized the fact that it is the conviction and spirit of the Association that the scientific and philosophical works of Swedenborg are of incalculable

value in the development of the theology of the New Church. The time was not ripe to determine with any exactness the relation between the theological and the philosophical writings, and moreover, we needed to become far better acquainted with the latter. But, standing as it did, for the publishing, promulgation and study of these works in recognition of their value to the church, the Swedenborg Scientific Association was a body that should unite men from all over the church who were in sympathy with this purpose; and the speaker took it as a happy augury for the growth of the Association that the present meeting was attended by the President of the General Convention and the Bishop of the General Church.

THE REV. L. F. HITE heartily seconded Mr. Acton's voicing of the general appreciation of the President's address, but he wished to correct the impression made in the address that Swedenborg's philosophical works were not taught in the New Church Theological School at Cambridge. In his own courses on Philosophy the general doctrines of the New Church are presented as expounded throughout Swedenborg's works, including his philosophical works,—the Introduction to the *PRINCIPIA* and selected chapters from the *ANIMAL KINGDOM* being read in full.

PRESIDENT SEWALL, referring to Mr. Acton's felicitations at the presence of two honored members of the Association,—the Bishop of the General Church and the President of the General Convention,—invited these gentlemen to address the Association.

MR. SMYTH, in responding, felt somewhat as a prodigal, realizing that he had been so long time absent from the meetings of the Association; but this absence had indicated no loss of interest, and certainly no loss of faith in the great purposes for which the Association had stood from the beginning and for which it stood now. The *PRINCIPIA* was the work that had first opened his eyes to the wonders of Swedenborg's early philosophy, and his admiration had been further deepened by the reading of the *RATIONAL PSYCHOLOGY*. "I have come to be absolutely convinced that the two great cardinal principles which are at the basis of all which Swedenborg has given, whether in science or in religion,—the doctrine of degrees and the doctrine of correspondences,—were gained when he was toiling and delving with that wonderful industry which marked all his work from the beginning. There is no question in my mind that there is one continuous growth, or path, or,—better stated,—ladder, reaching from earth to highest heaven, with the rungs all marked out, from the very beginnings of this man's discoveries and inductions to the end,—from the mineral world clear up into the celestial world; and we make a mistake if we mark too distinctly the difference between Swedenborg as a scientist and Swedenborg as a theologian." The speaker believed that when Swedenborg finally entered into the spiritual world, through intromission, he carried with



him not simply the idea, but the knowledge of degrees and correspondences, which he had learned in these investigations of the natural world; and that those knowledges were completed by his being carried up into regions where he could see them in all their wonderfulness. To see them in their application as a support to the Holy Word was the great distinctive feature of Swedenborg's illumination. There was no break between the two periods of Swedenborg's life; they belonged together, and the one would be absolutely incomplete and, he dared to add, impossible, without the other.

BISHOP PENDLETON thanked the President for his invitation to speak as a representative of the body to which he belonged. He would bear witness to the great interest in that body in the work of the Swedenborg Scientific Association, an interest which had existed from the very beginning, and more,—an interest in the thing itself, which the Association represented. The interest in Swedenborg's philosophical works was very great in the General Church. In every society there were classes for the study of those works in connection with the study of the Writings themselves. He feelingly testified to the fact that this interest had been greatly stimulated by the studies and researches of Miss Lillian G. Beekman. It was impossible for him to express in few words his appreciation of the importance of Miss Beekman's work, which had excited greater interest in the scientific works of Swedenborg, that had ever before existed.

13. The NOMINATING COMMITTEE recommended the following gentlemen as nominees: For President, Dr. Frank Sewall, and for Directors, Dr. F. A. Boericke, Mr. Horace P. Chandler, the Rev. Alfred Acton, Mr. E. F. Stroff, the Rev. Louis F. Hite, the Rev. Reginald W. Brown.

No further nominations being made the Secretary was instructed to cast the ballot for the above-mentioned nominees.

14. The meeting listened with great interest to an extemporaneous address by the REV. ALFRED ACTON, being a presentation of the doctrine concerning the Nature and Office of Sensation, as given in one of the physiological papers written by Miss Lillian G. Beekman.

It was shown that the grey cells of the brain are the proper organ of sensation, that the state of these cells may be modified and determined by sensations received and repeated, and that they are therefore the very things that can be educated and trained. It was also shown how the membranes and dendrites functionate in communicating sensations to the grey cells. But the greatest emphasis was laid upon the ab-

solute self-determinative nature of the nucleus of the grey cell or cortical gland and the function of this nucleus in the interior development and fixation of the individual life, or its quality as to will and understanding.

The address was followed by brief remarks by Mr. Hite, President Sewall and Mr. Smyth.

15. The REV. ELDRED E. IUNGERICH read a paper on the First Natural Point and the Active of the First Natural Point.

Assuming that the terms Infinite and First Natural Point of the *Principia* are the exact equivalents respectively of the theological terms Esse and Essence, or the Divine Itself and the Divine Human, Mr. Iungerich considered the further distinction between the natural point and the Active of the point as affording a means to arrive at a clearer and more philosophical understanding of certain theological doctrines about the Divine Human, his thesis being—that the Active of the point, as distinguished from the natural point, is the Divine Human, the Word, or the Son of Man, as distinguished from the Divine Human in Itself or the Son of God.

16. MR. WILFRED HOWARD presented a paper summing up the results of some experiments he has been making on the relation of Ether to Sound.

Mr. Howard's studies were made in connection with the statements of Swedenborg in the *Miscellaneous Observations* and elsewhere that the ether plays an important part in the transmission of sound. He pointed out the fact that the rate of transmission of sound in various substances is roughly proportionate to their conductivity of heat and electricity; and that this suggests that the ether functions in the transmission of sound. Mr. Howard experimented with an electric bell in a sealed vessel of air suspended in the receiver of an air-pump, Swedenborg's hypothesis being that "sound is a fluctuation or undulation in the ether, which can arise only from a vibration in the air." Mr. Howard experimented with sealed vessels and receivers of both glass and copper, and though there was no distinct evidence of the transmission of sound across the air-vacuum, still some very interesting differences between the glass and copper were indicated.

17. During the reading of his Annual Address, President Sewall had laid before the Association the new edition of the English translation of the *PRINCIPIA*. The interest in the



appearance of this work, looked forward to for so long a time, led to the unanimous adoption of the following resolution:

*“Resolved,* That the Swedenborg Scientific Association at its Fifteenth Annual meeting is greatly gratified to have laid before it the New Edition of the English Translation of Swedenborg’s *Principia*, now published by the Swedenborg Society of London, the work having been begun under the auspices of the General Convention and continued by our Association, which, after a number of years’ labor, turned it over to the Swedenborg Society for final revision and publication.

“We wish to congratulate the Swedenborg Society on the appearance of the work and on the inclusion of the smaller works on related subjects, especially on the inclusion of the MINOR PRINCIPIA.

“At the same time we regret that there should have been placed at the end of this great work a negative individual criticism such as is contained in Dr. Very’s Appendix.”

18. Various members in speaking on the resolution strongly emphasized their regret that Mr. Very’s criticism should have been published in the work itself. The discussion led to the unanimous adoption of the following motion: “That the President and Secretary constitute a committee to write to the Swedenborg Society expressing the objections of the Association.”

19. It was proposed that the next Annual Meeting of the Association be held in Boston at the time of the meetings of the General Convention. In the discussion it was pointed out that the charter of the Association requires that its annual business meetings be held in Philadelphia; other meetings, however, might be held elsewhere. The general sentiment favored a meeting at Boston next year, but on motion the matter was referred to the Board of Directors.

20. The AUDITING COMMITTEE reported that it had examined the Treasurer’s books and found the statement to be correct.

21. The general policy of the NEW PHILOSOPHY was con-

sidered, especially in regard to the introduction of material other than translations of Swedenborg. The conclusion was that former actions of the Association had left the Editor sufficient scope to introduce such material as he deemed useful. Several also spoke of the advisability of increasing the size of the *New Philosophy* to make possible the inclusion of new material without sacrificing the space now devoted to translations. It was said that such an increase in size would be made if justified by an increase in the number of subscribers.

On the motion of the Rev. E. J. E. Schreck it was unanimously

*“Resolved, That the proposition of Mr. Alfred H. Stroh that all of Swedenborg’s works and writings be published in the original languages in a uniform edition is viewed favorably by this Association.”*

Speaking on this resolution Mr. Doering stated on behalf of the Academy of the New Church that that institution is ready to co-operate with any other body or bodies in the preparation of plates of Swedenborg’s works in the original, such as are now being published by the Royal Academy of Sciences in Stockholm, and that it is further willing to contribute one-half toward the expense of such an undertaking.

The meeting adjourned at 6 P. M.

REGINALD W. BROWN,  
*Secretary.*



## FINANCIAL STATEMENT.

May 1, 1912.

## RECEIPTS.

Balance as per previous report .....	\$251 78
Received from dues and subscriptions ....	\$255 37
Sale of publications .....	11 49
	<hr/> 266 86
	<hr/> \$518 64

## EXPENDITURES.

Printing <i>New Philosophy</i> , July, 1911, to April, 1912 .....	\$167 44
Reprint of President's address .....	6 47
Printing index and title page .....	13 90
Paper for <i>New Philosophy</i> .....	16 50
Cover paper " " .....	9 00
Paper for publications .....	84 00
Printing covers for De Sale .....	1 50
Binding De Sale .....	26 40
General expenses as per cash book .....	20 68
	<hr/> 345 89

Balance ..... \$172 75

The above balance includes amounts carried on the following accounts:

Royal Academy publications .....	\$10 00
" " " plates .....	2 00
Worship and love of God .....	11 60
	<hr/> \$23 60

Audited and found correct, May 16, 1912.

C. E. DOERING,  
W. H. ALDEN,  
*Auditors.*

## A REPORT AND COMMUNICATION

TO THE

## SWEDENBORG SCIENTIFIC ASSOCIATION.

*The Swedenborg Scientific Association:*

My first duty in submitting the present Report and Communication is to express to the Association my heartfelt acknowledgment of the resolutions passed last year respecting the work in Sweden. Now that the chief printing societies of the New Church have united in the important use of reproducing Swedenborg's MSS. by photographic methods, a use fundamental not only to the printing of Swedenborg's theological texts, but also of his scientific, philosophical and miscellaneous works and documents, the scope of proceedings in Sweden has indeed been greatly expanded, but the future historian of the Swedenborg Scientific Association will record with satisfaction that the success of the present comprehensive movement was largely due to the faithful and energetic support of the Association during a period when very few persons realized the fundamental importance of the work whose value has now been acknowledged by the whole New Church and also by the universities and learned societies of Sweden. The Association cast its bread upon the waters, and after many days it has returned.

My second duty is to thank the Association for the grant of money recently received through the Treasurer of the London Swedenborg Society. This contribution will be employed for special work on the scientific MSS. of Swedenborg, especially upon those which have been copied for the Association, but not yet revised. During the past year the following unrevised copies of MSS. or portions of MSS. have been transmitted to the Secretary of the Association: Codices 36, 37, 86, 88 (a portion only) and 99 (printed 1904 in *Noraskog's Arkiv*). The MSS. formerly sent were Codices 81, 82, 83,



84 and 85. I am also about to forward all the copies made by or for me and which were presented to the Association some ten years ago. As the Secretary of the Swedenborg Committee of the Royal Swedish Academy of Sciences I have to thank the Association for the use of these copies in the edition of the scientific texts, *Opera Quaedam de Rebus Naturalibus*.

In the great stress of work in connection with the recent celebrations in memory of Swedenborg the printing of texts and translations was considerably delayed, but it is now making more rapid progress and new plans for its extension have been submitted during the past year and in some cases adopted. Vols. III. and IV. of *The Brain*, having been to a great extent prepared for press by Dr. R. L. Tafel and the Rev. James Hyde, I suggested last year to the Swedenborg Society's Committee that these materials be submitted to Professor O. M. Ramström and myself for further examination and preparation in connection with the editing of the Latin texts of *The Brain* in *Opera Quaedam*. The suggestion was adopted and it is hoped that as the work on the Latin texts proceeds the English translations, Vols. III. and IV. of *The Brain*, will also be completed for publication. Students of Professor Ramström's *Investigations*, etc., will realize what kind of work may be expected from this eminent authority. If the historical and critical investigations of Swedenborg's contributions to science and philosophy can be accomplished in the same thorough way in which Professor Ramström has treated and solved special questions in his *Investigations* much substantial progress will be made. Certainly a powerful new light has during recent years been thrown upon Swedenborg's geology, cosmology and brain anatomy by Professors Nathorst, Arrhenius and Ramström, showing the grandeur of Swedenborg's discoveries and also indicating his limitations. It is this balanced, comparative, critical study which is so much needed in the discussion of these difficult problems.

A distinguishing feature of the newer researches into Swedenborg's science and philosophy which is coming to the front more and more is the discussion of the literature which

Swedenborg employed, the historical sources which influenced his investigations, and indeed furnished the basis without which he could never have accomplished his work. In reviewing the history of interpretative discussion of Swedenborg's "early works" it is astonishing to see how little has been done to examine into these sources. Many comparisons have been made of the discoveries and theories of Swedenborg's scientific and philosophical works with the later theological works, and with modern science and philosophy, but the important field of the sources and development of the *Principia* and *Regnum Animale* has been but little cultivated. The Cartesian philosophy of particles and vortices and the subsequent Newtonian non-vortical theories are more and more clearly seen to be two of the important factors which most deeply influenced all physical philosophy during the period of 1650-1750, and which explain a great many ill-understood features of Swedenborg's *Principia*. Nor should the Cartesian psychology be neglected in a critical study of Swedenborg's early discussions of mind and body.

I need only refer very briefly to the articles and memorials on the phototyping and proposed complete edition of Swedenborg's texts recently submitted to the printing societies of the New Church, to several periodicals, and in over a hundred copies to editors and other interested persons. The stereotyping and *Opera Omnia* proposals have been very heartily endorsed by some of my correspondents, but no decision can as yet be arrived at. Since these questions also intimately concern the publication of scientific texts by the Association I recommend the proposal to stereotype all of Swedenborg's texts in the same size and type to your careful consideration. Since so many of Swedenborg's texts are now being published or proposed for publication in Europe and America it would seem to be prudent to prepare for a final complete edition of all of Swedenborg's literary remains. Only then will athletic students of his works be able to follow in detail the various stages of their development. Such an edition, *Opera Omnia Emanuelis Swedenborgii*, is most desirable, and by stereotyping all the texts as they appear the final accomplishment of the plan will be secured.



Hoping that the Association will have a successful meeting, I remain,

Yours faithfully,

ALFRED H. STROH.

Stockholm, April, 1912.

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## PRESIDENT'S ADDRESS.

### THE SWEDENBORG SCIENTIFIC ASSOCIATION; ITS AIM AND ITS ACHIEVEMENTS.

BY FRANK SEWALL, A. M., D. D.

The Swedenborg Scientific Association holds at this session its fifteenth annual meeting.

The call for the meeting to organize this body was sent out from Washington, D. C., April 27, 1898. It had the endorsement, as publicly announced, of the following persons:

The Editor of *The New Church Messenger*, New York; the Editor of the *New Church Review*, Boston; the Editor of *New Church Life*, Philadelphia; the Editor of *The Morning Light*, London; the Editor of *The New Philosophy*, Urbana, O.; Rev. S. M. Warren, Boston; John R. Swanton, A. M., Harvard University; Riborg Mann, A. M., Ph. D., Associate in Physics, University of Chicago; Thomas French, Jr., Ph. D., Prof. of Physics, University of Cincinnati; L. P. Ford, Esq., Shortlands, Kent, England; W. Posthuma, Esq., London, England; Mr. Ernest F. Robinson, Toronto, Canada; E. R. Ellis, M. D., Detroit, Mich.; J. T. Kent, M. D., Philadelphia; Harvey Farrington, M. D., Philadelphia; Felix A. Boericke, M. D., Philadelphia; Edward Cranch, M. D., Erie, Pa.; Edmond Congar Brown, Esq., New York; the Rev. Lewis F. Hite, Theological School, Cambridge, Mass.; the Rev. Lewis P. Mercer, Chicago, Ill.; the Rev. Eugene J. E. Schreck, Detroit, Mich.; the Rev. John Faulkner Potts, B. A., Philadelphia; the Rev. C. Th. Odhner, Philadelphia; Frank Sewall.

Pursuant to this call the first meeting of the Association was held in the City of New York on May 27th-28th, the same year, in the rooms of the American Swedenborg Printing and Publishing Society. Thirty-seven persons were present, coming from Boston, Mass.; Brooklyn, N. Y.; Chicago, Ill.; Detroit, Mich.; Erie, Pa.; Huntingdon Valley, Pa.; Newark, N. J.; New York City; Orange, N. J.; Philadelphia, Pa.; St. Peters-

burg, Russia; Vineland, N. J.; Washington, D. C., and Yonkers, N. Y. The Association was organized by the adoption of a constitution and the election of the following board of officers: The Rev. Frank Sewall, *President*; Mr. John R. Swanton, *Recording Secretary*; Mr. Riborg Mann, *Corresponding Secretary*; Mr. Edmond Congar Brown, *Treasurer*, and as additional members of the *Board of Directors*: Dr. F. A. Boericke, of Philadelphia; Rev. John Whitehead, of Urbana, Ohio; Dr. J. B. S. King, of Chicago; Dr. Edward Cranch, of Erie, Pa.; Rev. E. J. E. Schreck, of Detroit, Mich.; Rev. L. F. Hite, of Boston; Dr. L. C. Ager, of Brooklyn; Dr. Harvey Farrington, of Philadelphia.

The unanimity with which the various bodies and the scholars of the church entered into the proposed work of the Association is shown in the fact that the republication of the *Principia*, which, with the transcription and publication in English of the *Lesser Principia*, was the first large work undertaken, called forth the ready co-operation of the General Convention of the New Church of America, and of the Swedenborg Society of London, the General Convention having already in one of its committees had the same proposition in hand, and the Swedenborg Society having been addressed on the subject of its resuming the publishing of the Scientific Works. This had been begun by the first "Swedenborg Association" organized by Clissold, Wilkinson, Strutt and others in 1846, but had been relinquished for many years, leaving the *Principia* entirely out of print and many valuable scientific papers of Swedenborg still in manuscript and inaccessible to the public.

Of this co-operative action the *New Philosophy* records that:

The General Convention of the New Jerusalem, at its meeting in Cleveland, June, 1898, heartily responded to the offer of the Swedenborg Scientific Association to coöperate with it in the publication of the *Principia*. The Convention unanimously voted to turn over the whole of this work to the newly formed Association, recognizing the fact that this work belonged more properly to a scientific organization than to one formed distinctly for religious purposes. The work of securing subscriptions and proceeding with the publication has now been taken up by the Swedenborg Scientific Association, and subscriptions may be made directly to it. We understand that subscriptions for over two



hundred copies have already been received. No price has yet been fixed for the work.

From the report of the Swedenborg Society of London it was learned that on a motion made by the Rev. J. R. Rendell, B. A., of Accrington, and amended by Mr. Clowes Bayley, the following resolution was adopted.

In view of the fact that this Society, in 1862, undertook to continue the work of the Swedenborg Association and, by resolution passed by its Annual Meeting in 1888, affirmed that the publication of Swedenborg's philosophical and scientific works is one of the legitimate uses of the Swedenborg Society, and of there being a widely expressed wish, both in this country and in the United States, that these works should be reprinted:

*Resolved*, That the Committee be instructed to proceed with the publication of the philosophical and scientific works of Emanuel Swedenborg as and when they deem it desirable to do so, and to coöperate, if possible, with the friends of the New Church in America.

Under these happy and fraternal auspices our Association was launched upon its career of usefulness. For a series of years our annual meetings were held in different cities, often in immediate connection with the General Convention. Such meetings have been held in New York, in Chicago, in Washington, in Philadelphia,—in the last city once in the Sunday School room at 22d and Chestnut streets, and once going out to Bryn Athyn at the close of the Convention meeting.

When, a few years ago the incorporation of the Association under the laws of Pennsylvania required a domicile or official home, such an official abode and address was fixed at Philadelphia, and since that time the annual meetings have been regularly held in this city, its publishing house and office being in the extensively known printing house, 9 North Queen street, Lancaster, Pa. The composition of the official board has undergone a number of changes,—the secretaryship having been held by Dr. John R. Swanton and the Rev. E. J. E. Schreck, the latter compelled to resign after the permanent place of meeting was adopted owing to impossibility of attending. The treasurership has been held by Mr. Edward Congar Brown, of New York; Mr. Carl H. Asplundh, and Mr. C. E. Doering, of

Bryn Athyn, previous to the incumbency of Mr. Emil Stroh, of Bryn Athyn. The editorship of the *New Philosophy* was originally in the hands of the Rev. John Whitehead, and the headquarters at 16 Arlington street, Boston. Following him was Rev. L. P. Mercer at the head of an editorial board consisting of Messrs. Sewall, Whitehead, C. Riborg Mann, H. Farrington, and E. J. E. Schreck. Later, Dr. John R. Swanton succeeded as managing editor, Alfred H. Stroh being added to the board of assistants. In 1904 the sole editorship was given to Dr. H. Farrington of Chicago, and in 1909 the duty was assumed by the present incumbent, the Rev. Alfred Acton.

Such being a survey of what we may call the local and personal history of our organization we may now with profit glance at the more important subject—the work that has been accomplished.

It is generally understood that age is retrospective and youth prophetic. You will indulge me, I am sure, if I look back to some of the prophecies of the youthful days of our Association,—even to quoting at some length the utterances in his inaugural address of him whom you have honored with the continued presidency of the body until this time.

It was in New York on the 27th of May, 1898, that the president's address on the "Use to be Accomplished by the Swedenborg Scientific Association" contained these words:

That the stupenduous achievements of Swedenborg in the fields of science and philosophy, from the time they were first published even until now, have been practically lost to the sight of the scientific world, it would be useless to deny. Even the church has ignored them, practically, at least, by open neglect, if not discouragement, of their study. For their only introduction to the knowledge of the modern world we are indebted mainly to those outside the professed New Church body, namely, to a learned clergyman of the Church of England, the Rev. Augustus Clissold, the translator into English of the *Principia* and of the *Animal Kingdom*, and to the American transcendentalist, Emerson, whose eloquent raptures over the magnificence and sublimity of Swedenborg's work as a philosopher the New Church has been pleased to quote to the world, without ever, as a body, having acquired an adequate idea of what it was that the famous essayist was thus praising, permitting even the editions of the London Association of 1845 to go out of print, and being indebted to scholars and experts not of our body



for whatever public appreciation or bringing to notice of Swedenborg's deserts the world has witnessed in recent years. (Witness the edition of the *Ontologia*, translated from the photolithograph manuscript by Professor Cabell, of Urbana University, and published at the expense of the Rev. William R. Alger, of Boston; the researches, recently published, of German and other European scholars, into the merits of Swedenborg's cosmogony, as also of his psychology and philosophy in general. See article by the astronomer, Nyrèn, of Pultowa, Russia, on Swedenborg and the Nebular Hypothesis, in the *Vierteljahrschrift der Astronomischen Gesellschaft*, Leipzig, 1879, p. 81; articles on Swedenborg and Kant, by Prof. Vaihinger, of the University of Halle, in the *Kantstudien*, vols. I. and II.; the article by Max Heinze, Member of the Royal Academy of Science of Saxony, on Kant's *Vorlesungen über Metaphysic*, showing the impress of Swedenborg upon Kant's mind and teaching, notwithstanding all the assumed persiflage of the "Dreams of a Visionary," etc., in *Abhandlungen der Sachsischen Gesellschaft der Wissenschaften*, Philologisch-historische Klasse 14, pp. 556 ff., Leipzig, 1894, etc.) While we must not overlook the notable exceptions to this general neglect of Swedenborg's scientific works—in those productions of avowed Newchurchmen, the magnificent translations by Dr. Wilkinson and Dr. Strutt, of England, of the fragments of the philosophical and anatomical series ("Generative Organs," "Posthumous Tracts," "Outlines of the Infinite," by James John Garth Wilkinson, Member of the Royal College of Surgeons of London, "Miscellaneous Observations," by Charles Edward Strutt, Member of the Royal College of Surgeons of Edinburgh), in the colossal work undertaken by the late Rev. Dr. Rudolph Tafel, in translating, editing, and publishing the work "On the Brain," also in the translation and publication in America of the work, *De Anima* ("On the Soul, or Rational Psychology"), translated from the Latin and edited with introduction and notes, by Frank Sewall, New York, 1886—still it must be allowed that these works, like others, received but little attention from the New Church as a body, and that with the exception of the last named and the work on the Brain, they have been allowed to go out of print and become inaccessible to the ordinary student, while the work on the Brain is left with only two of the projected four volumes ever brought to completion.

The reasons for this neglect and lack of appreciation in the past it is not necessary here to go into, except so far as they throw light on the duty of the present. In brief, it may be said that the interest in the theological writings had the rightful precedence, not only in meeting the more immediate need of the world, but also as really introductory to a true and worthy interest in the scientific and philosophical writings, and that whatever has been the appreciation shown by scientists and scholars as such, who have not, at the same time, been receivers of

Swedenborg's theological teachings, this cannot equal in depth and value that which will be felt by those who shall see and rightly estimate the two systems in their mutual significance, and behold them in their synthetic completeness as constituting a single and perfect system. On the other hand, while the early receivers of the theological doctrines showed but little appreciation of the scientific works, for the sufficient reason that they knew almost nothing about them, and were not, as a general thing, men of scientific acquirements such as to render them capable of understanding them if they had known them, it must be said that in this regard Newchurchmen were not very different from the rest of the world at the time, even from that which called itself scientific.

And at the second annual meeting held also in New York, April 13, 1899, the president's address pursued further the subject of Swedenborg's contribution to science and philosophy in the following words:

Sensuous knowledge is not given by revelation; nor can any knowledge of nature be regarded as final and exhaustive. Even though Swedenborg may have anticipated modern inventors and scholars in many important discoveries, and a certain amount of pride may justly be felt by his followers in having his deserts recognized, still now that the facts have become common property there is no call for a special publication of them under Swedenborg's name.

On the other hand, what does constitute a real and positive contribution to science and philosophy to be found in Swedenborg and nowhere else, and, therefore, what does justify this movement of our Association to restore his science and philosophy to the knowledge of the learned world, is this: The use that Swedenborg has made of the vast range of facts at his disposal and the use as indicated by him to be made of the still vaster range at our disposal, to which Swedenborg's principles will equally apply, in constructing a theory of the universe in which all that which is verified in science, all that which is rationally concluded in philosophy, and all that which is revealed in Christian theology shall be found to be in mutual harmony and mutual corroboration.

When we see the eagerness with which the world seizes upon anything like a satisfactory showing of the presence of a truly divine intelligence working in nature and a truly divine purpose underlying man's whole career and destiny, we may wonder that Swedenborg's explanation of these problems of nature and of life have not long ago been accepted instead of remaining hidden, while every poor fragmentary reflection of his splendid system is caught at so gladly and trumpeted abroad as a new discovery of momentous import. The mild and



cautious "intimations of immortality" and of God's personal existence put forth so timidly, but who shall say not wisely, by John Fiske and William James, not to speak of the sugar-coated kind of idealism offered to the natural plane of mind by the late Professor Drummond, and another and purer idealism offered, to continue the same figure, not so much sugar-coated, as drugged with the strong spirit of intellectual pride, in the later forms of Platonism and the schools of Kant and Hegel—these show unmistakably that the world is not and will not be satisfied with any system of science which sets aside the spiritual as an outlived and no longer needed branch of knowledge. To the question why does not Swedenborg speak to this need? the answer is, perhaps, the true one, that we have either shut him up in the pulpit or if we have allowed him to go out and walk abroad in the public thoroughfares we have compelled him to wear the church vestments wherever he goes. Now we know that there are minds that are terrified at sight of these things, and most of all when "they think that they have seen a spirit!" The only way to allay their fears is to walk with them quietly in the twilight and talk together as man with man and produce an assurance that it is not with the voice of dogma that Swedenborg is speaking in these works, but in the effort to save the reason from the dogmatism of sense and keep it in the freedom of the light of spiritual truth.

Science can well afford to pass Swedenborg by among the world's great forgotten ones, if he has naught to hold out to her but the facts which she possesses in abundance already, caring not from whom they come or whose name they bear; but if to the question, "What shall I do with this accumulated mass of information that shall make life here more worth living and open vistas to higher life beyond?" Swedenborg can give an answer that can come from no one else then must science listen with a grateful and reverent ear.

It is interesting to reflect that at the time these words were spoken the mortal remains of Emanuel Swedenborg were lying hidden away in an obscure little church in the slums of East London; and vast treasures of his scientific writings were equally hidden away in their almost illegible manuscript on the rarely touched shelves of the Royal Library at Stockholm. Many of the most wonderful and interesting of the minor Scientific Works, such as the work on Tremulation, the Corpuscular Philosophy, the Summary of the Principia, not to speak of the Minor Principia and the work on Creation, were quite unknown and inaccessible to the general reader. Even the great work on the Brain lay in part still imprisoned in its obscure

MS. in the Stockholm Library, whose authorities were accordingly helpless in answering an appeal as to its contents coming from an expert in the University of Vienna. Our Association having enlisted the cordial interest and assistance of the General Convention, and of the Academy of the New Church, at this time was sending to Sweden our young brother, Alfred H. Stroh, as an expert in deciphering and transcribing the original MSS. of Swedenborg with a view to their gradual publication and translation. By a happy and remarkable Providence Mr. Stroh's arrival and the beginning of his researches coincided with the efforts of the embarrassed librarians of Stockholm in their endeavor to get access to Swedenborg's works in a legible text. What followed the recognition by the Royal Academy of Mr. Stroh's ability, not only to aid in their own researches, but to enable them to give to the world at large these hopelessly hidden treasures of Swedenborg's unpublished works, has become a history, or, more truly, a panorama of events too widely known to require repeating here, and must belong to one of the most picturesque and imposing episodes anywhere to be found in the history of science and of literature.

It was from that initial effort of our Association to publish the Scientific Writings that have come, by way of mutual friendly assistance in bringing to light the hidden works of Swedenborg and the consequent appreciation by the authorities in Sweden of the greatness of their nearly forgotten and exiled countryman,—the splendid series of public honors paid to Swedenborg, both in England and in Sweden, in the transporting of his remains in state to Sweden and their being enshrined in the Cathedral at Upsala amid all academic, civic and royal honors; also the presence at the International Swedenborg Congress held in London in 1910, under the auspices and patronage of the King of Sweden, of a body of scholars from Sweden and from the Continent of Europe, to contribute valuable papers on various phases of Swedenborg's Science; and finally, the issuing by the Royal Swedish Academy of Sciences of the superb monumental edition of the *OPERA OMNIA SCIENTIFICA ET PHILOSOPHICA* of Swedenborg, of which edition,



under the editorship of the most renowned scholars and specialists of Sweden, three volumes, the *GEOLOGICA*, the *COSMOLOGICA* and the *MISCELLANEA*, have already appeared.

Meanwhile at home the following publications have appeared during this interval of years, either directly under the editing and publishing of our Association or by its incentive and patronage: A reprint of the *ECONOMY OF THE ANIMAL KINGDOM*, and a second and revised edition of the work on the *SOUL* or *RATIONAL PSYCHOLOGY*—through the press of the New Church Board of Publication. The work on *TREMULATION*, published in Boston; the *ONTOLOGY*; the *SUMMARY OF THE PRINCIPIA*; the *HISTORY OF CREATION*, and a series of minor scientific and philosophical treatises in three numbers, translated into English from the Latin or Swedish by Alfred H. Stroh. Also the *SUGGESTIONS FOR A FLYING MACHINE*; a beautiful edition of the *Poems of Swedenborg* and of the *Festive Address on the return of King Charles XII from the expedition in the south*.

Various studies and elucidations of these and other themes in Swedenborg's philosophical system have been presented in the pages of the Association's quarterly, the *NEW PHILOSOPHY*, a list of whose titles and writers would be too long to be inserted here. They have exhibited much profound study and industrious research on the part of the writers, and they constitute a unique and very valuable store of information to be resorted to by future students. Especially deserving of mention among these are the early papers on Chemistry, by Professor C. Riborg Mann; the contributions of Dr. John Swanton on the corpuscular philosophy and other subjects; the brilliant papers by Miss Beekman on Cosmology, the Brain, the New Stars, etc., culminating in interest with the series now beginning on Physiology or the Human Form; Alfred Stroh's essays on *LIGHT AND COLOR*, *ON THE THEORY OF FIRE*, and his study of the work on the *WORSHIP AND LOVE OF GOD*; W. F. Pendleton's article on the *RELATION OF THE SCIENTIFIC AND THEOLOGICAL WORKS*, and on the *CREDIBILITY OF SWEDENBORG'S SCIENCE*; Reginald Brown's *TRANSLATION OF SWEDENBORG'S NOTES RELATING TO THE*

LARGER PRINCIPIA; Mr. Stroh's translation of Swedenborg's MOTION OF THE ELEMENTS, and Dr. E. A. Farrington's essay on the RELATION OF THE CHEMICAL ELEMENTS TO SWEDENBORG'S DOCTRINE OF THE ATMOSPHERES AND SALTS. The president's paper on Swedenborg's Influence upon Goethe, originally read before the American Philosophical Association at the opening of the Emerson Hall of Philosophy at Harvard University in 1902, is of interest on account of the introduction it gives to contemporary appreciation of Swedenborg in Germany; and the annual presidential addresses, as published in the NEW PHILOSOPHY, will be found to have touched upon most of the salient philosophical and scientific theories that have been broached during this period in this country and abroad; while Alfred Stroh's historical reviews of the progress of the work of research and publication in Sweden will constitute a narrative of ever-increasing interest as the years go by and the fruits of these labors begin to appear. Intimately related to our work have been also the address delivered before the European Congress of Anatomists in Berlin, by Professor Gustave Retzius, the editor-in-chief of the Royal Academy's edition of Swedenborg's Doctrine of the Brain, and the addresses delivered by Alfred Stroh before the European Philosophical Congress at its meetings in Heidelberg and in Bologna, treating of Swedenborg's philosophy in its historic relations. The addresses of Professor Neuberger in Vienna and of Professor Santeson, of the Caroline Institute of Upsala, which have appeared in prominent technical journals, have also contributed to that dissemination of a knowledge of Swedenborg's philosophic system in the scientific world at large which was one of the chief aims inspiring the organization of this Association. Lastly, but justly of first importance and value, came the translation into English of Swedenborg's treatises on the SENSES and on the FIBRE, which have for several years past occupied almost exclusively the pages of the NEW PHILOSOPHY with the exception of the issues devoted to the proceedings of the Association's annual meetings.

Such being the tale,—what now is the moral? What are we to conclude from this survey of the Association's labors during



these fifteen years as to the real vindication of the promises or prophecies of its youth?

To my mind the moral assumes the form of a problem—a serious and deeply interesting one which requires for its solution something more than a hasty running over the lists of figures, or of events, or of great names. It is the situation itself that we are to face, whether it has fulfilled our hopes and ambitions or not, and by the situation we are to endeavor to be guided as to what shall be our duty and our legitimate expectations for another period, longer or shorter, of our labors.

The situation seems to be plainly this, that while in what we call the outside world the interest in Swedenborg's science and philosophy seems to have been awakened and extended as never before, in the church itself or among those who accept the theological writings this interest seems to have become, with many at least, more and more torpid and cold. This would seem apparent in three ways: The allowing of the scientific works to be unpublished and unread, the ignoring of them in our systems of education, and the diminishing interest shown by the church at large in the work of our Association. Not only has the membership of our Association not grown, but together with the subscription list to our quarterly, it has especially of late been seriously falling off. The demand for the scientific works, whether here or in England, would seem to be almost *nil*. The publishers in America of the *ECONOMY OF THE ANIMAL KINGDOM* and the *RATIONAL PSYCHOLOGY* neither advertise these works nor call attention to their existence in any form. So far as the information of the general public is concerned they might almost as well have never been published. In England where the *PRINCIPIA* and the other works of the splendid series produced by Clissold and Wilkinson have been for long years out of print, and so out of the current inquiry and interest of the learned world, the new edition of this great work—undertaken with so much enthusiasm by our body at its origin, and after some years of critical labor in the revision of the translation, turned over with a liberal list of subscribers to our friends of the Swedenborg Society in En-

gland—as the firm from whom we would naturally expect the second edition,—there the work, only after some ten years of waiting, has at last come from the press, and is here as a tangible witness of the real degree of our zeal in prosecuting the science and philosophy of Swedenborg.

The absence of the books on the market might indeed account for the lack of them in the homes of the people; but even this cannot account for the absence of their use in our so-called New-Church schools. Under a former administration in Urbana a considerable contribution was made to the bringing out of the philosophical books; the translation of the *DE ANIMA* having been made there, also a translation of the *ONTOLOGIA*, afterwards published, and a transcription of the photolithographic volume, *DE CEREBRO*, of some 350 folio pages, made by the late Professor Cabell, was sent by request to the Royal Library in Stockholm, where it still remains. In the curriculum of the College the Introduction to the Principia, on the “MEANS CONDUCIVE TO A TRUE PHILOSOPHY” and on the “TRUE PHILOSOPHER” was made a part of the course in Philosophy. That was many years ago. I do not know that there is at present the slightest mention of the scientific and philosophical works in the regular courses of study, either there or in the Theological School of the General Convention\* or of the New-Church College in London. The vast amount of editorial work of incalculable value which has been done in the Academy of the New Church would indicate a practical appreciation in that institution of the value of these works, if not for immediate use in the curriculum studies, at least in the researches of scholars and the laying of foundations for a healthy philosophy in the future.

The problem that presents itself to us is, then, that of a decrease of interest amounting almost to an apathy in the church body itself, running parallel with an activity and an extensive-

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\*In the discussion which followed the address it was brought out by Professor Hite that the item, “Creation,” in the philosophy course of the Theological School

included a study of the scientific writings. In the address it was assumed that this title referred only to the doctrine as set forth in the *Divine Love and Wisdom*.



ness in the publishing of Swedenborg's science mainly under auspices entirely foreign to the New Church such as have never been known since Swedenborg passed from the earth.

It is my purpose in this address simply to present the situation—not to complain of it, for that would be idle, as it would be unjust, inasmuch as books cannot be studied if they are not to be had, and even with books the science and philosophy of Swedenborg cannot be learned without accomplished teachers, and accomplished teachers cannot be procured except through years of training and of patient research following those steps by which the great philosopher himself “from being a fisherman in science became a spiritual teacher” and leader. The materials would now indeed seem to be at hand in abundance as never before; what is needed is the willing, the devoted, the patient spirit of study with the sole purpose of mastering in some slight measure the mighty principles involved in the system, and of teaching them to a class of minds who shall be experts in this new doctrine and capable of building, through expositions in literature, in schools, in universities, an entirely new school of science and philosophy, which shall march forward, hand-in-hand, with the theology of the New Church in opening the way in the minds of men to the vision of not only a new heaven but a new earth.

I believe that the deeper we go into the study of Swedenborg's scientific system the more we shall be convinced that the matter of progress in this science, whether in the church or in scientific circles, is not to be a matter of startling acknowledgments by persons of eminence, of brilliant essays and orations, of splendid encomiums upon Swedenborg's genius and acquirements, nor even of the church's superficial reading of these works in the manner of most of its study of the theological works. It is not alone the church or the spiritual in man that requires regenerating; science itself must be regenerated; and as all real regeneration proceeds from within outward, so it must be with the regenerating of science. It must start from within, from some God-given recognition that the order of reasoning like that of creation is not from the circumference to the centre, but the reverse. Science must become not spirit-

ual—in the sense of abandoning matter and the mechanical world as its exclusive sphere—for these are the discrete plane not only of the faculty of science but of its exercise; but it must be born anew in adopting a new standpoint, where it can view its mechanical world as at least an “animated mechanism,” to use Swedenborg’s own phrase, and where it can see that the whole world of knowledge is a chaos and has no eternal value for man except as it recognizes an all-forming, all-directing END as the true inmost cause of all things.

Neither science nor the church will have reached even the threshold of Swedenborg’s science and philosophy until they are ready to accept Swedenborg’s full and frank confession that from a philosopher he became a theologian, and that accordingly his philosophy was a path from nature to spirit, and that the study of that path will open a similar path for men of all time, and so furnish that *nexus* between spiritual faith and the facts of science which alone can assert the unity of the world and of life. It is the system equally demanded by theology and by science if men are to progress in a rational religion.

Nor will we progress by ever so many touches or glimpses in the church at the outside of this system; the lauding of its poetry, its symbolism, its magical key of correspondences, its happy vision of the future life; nor in science by its vast survey whether of the starry heavens or of the human brain, nor by ever so intricate discussions of the point, the fibre, the vortex. As the recognition of the end is the first essential to the regenerated science so must theology explore even this *end* and find and declare its true nature, namely, that it is at once the Love of loves, the veriest Form of forms, and that Form none other than the Divinely Human Form, after which, not only man but all the heavens and the universe of worlds are fashioned in their whole compass and in every particular. To know the Human Form as the Divine Form of Forms, the constructing principle not only of worlds but of the knowledge of worlds must be the aspiration of both the church and science. What generations it may require in time, and what regenerations in human minds who can tell? But that the path lies



open to this knowledge in Swedenborg's combined system as nowhere else must be more and more conceded as that system is better known; and in the hope of such a confession we must do our work to the utmost of our ability in preparing for this gradual awakening to the appreciation and the application of Swedenborg's scientific system.

It is almost an encouragement that the world and even the church moves slowly in this recognition. An appreciation from the mind of ignorance is worse than no appreciation. There may be much preliminary work to be done before the church, and much less science, can presume even to pass judgment on the real value of these writings we are endeavoring to preserve and publish. Happy should we be that they have not been sounded to the bottom, whether to be approved or condemned by any knowledge that the world, as we know it to-day, possesses!

But patience must be the virtue of every really great and regenerating movement in the world. "In patience" we are bidden to possess our souls; not to abandon our souls, but to "possess them." And a noble example of such patience have we in the slow advance of that cause of which the author wrote so many years ago—"Tempus venit quando illustratio!"

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## PHYSIOLOGICAL PAPERS.

BY LILLIAN G. BEEKMAN.

### II.

#### FACTS AND OFFICES OF NUTRITION.

In the opening chapter of the *ANIMAL KINGDOM*, on the Tongue and the Sense of Taste, we note especially the statement that the tongue serves three great common offices, namely, *NUTRITION*, *SENSATION* and *MOTION*. These are great generals of office and use, the study of which must take precedence of all other study; for only on the basis of the great generals of office and use can any subject be approached rationally as to its ends, and thus the study carry with it its

full intellectual and spiritual content. Any rational grasp of Swedenborg's writings, whether of his earlier physiological works or of his later theological writings, must begin with the knowledge of these three fundamental offices of the organic kingdom: 1. The office of Nutrition. 2. The office of Sensation. 3. The office of Motion. These three offices we will take up in the ensuing papers of the present series, where each shall be treated of according to its place and relation in Swedenborg's great doctrine of the scheme of creation, that is, according to its place in the chain and bond of order, as order was fundamentally defined in the passage from the TRUE CHRISTIAN RELIGION quoted in the first paper.

The nutrition of the organic form or body is specifically the nutrition of the blood, for all food taken in, is for the sake of the nutrition of the blood (A. K. 578). Indeed the ANIMAL KINGDOM is entirely occupied with the story of the series of organs concerned in the bond and chain of this single use of the nutrition of the blood and its maintenance in working integrity. The first volume deals with the tongue, salivary glands, stomach, œsophagus, intestines, mesentery, liver, pancreas, spleen, and kidneys,—organs which make up the great group immediately and obviously concerned in this one cycle of the use. And the second volume takes up the study of the lungs and the skins or tunics of the body, outer and inner, with their imbibing mouths and ducts, as an even more important set of organs involved in the more intimate nutrition of the blood.

Nutrition resolves itself primarily into the nutrition of the bloods. How high is the correspondence of the bloods is indicated by the statement that the heart and the blood belong to the celestial kingdom (S. D. 5575). The brains desire nothing more in the prenatal life than that the heart and blood shall be formed to be associated with them as helpmeet in the weaving in the body of their organic use. It is through the celestial correspondence of the blood that the Lord is able to associate the celestial heavens with Him in that marvel,—the prenatal formation,—every step of which is of the Lord's direct Providence. In the body the bloods themselves are the very foot-



hold, the theatre, the workshop of the Lord's presence and the celestial uses; in them the Lord and the celestial kingdom are intimately present and executive throughout the whole organic world of man. How high this correspondence is, is indicated by the statement that: As are the blood and the animal spirit in the body of man, so is the Lord in the kingdom of the human race, both those of past ages, and at present and yet to be. And that as are the ways of the blood vessels and the blood therein, and as are the ways of the nerve-fibres and the animal spirit therein so are the ways by which the Lord interiorly leads man, rules him, forms him, reforms him continually.

"The whole of the Grand Man is organic representing the purer and grosser membranes of the body, while the Lord alone represents the interiors, thus, in the derivatives, the bloods. . . . The Grand Man is only an organic, consequently a membranous, to which correspond the organic or membranous things of the body which are actuated by the life of the Lord, thus think and act from the Lord. The Lord alone, inasmuch as He is life, vivifies and actuates them. Therefore He is represented also by the animal spirit or bloods in the ultimate nature of the body. For His life is both in ultimates and in firsts." (S. D. 3419; see also 4016.)

If we wish to apprehend organic form,—that is, the firmer membranous structure thereof formed by the bloods of which it is as it were the offspring—we must study first the great generals of the constitution of the kingdom of the blood and its serum. That is, we must get a view of the substances that go to its makeup,—the parts, and the arrangement of the parts, and the powers of each, separately and conjoined.

"For all parts of the system are fluid before they are solid, and the law according to which they solidify is founded on the law of their action as fluids, and the law by which they subsist is founded on that by which they exist." (I. E. A. K. 61.)

"The solid substances (in the body) regard the fluids as the causes of their existence and subsistence." (I. E. A. K. 170.)

Moreover the fluxion of the fluids in the body corresponds to the extension of the solids. (I. E. A. K. 90.)

Because of this, the blood is "an epitome of the riches of the whole world and all its kingdoms," so that, indeed, "it would appear as if all

things were created for the purpose of administering to the composition and continued renewal of the blood. For if all things exist for the sake of man, . . . then all things exist for the sake of the blood. . . . For the blood actually contains within itself the ground and the means by which every man is enabled to live a distinctive life." (I. E. A. K. 4, 5.)

The doctrine of the blood in its fulness will perhaps be the last in the order of completion in the understanding, since for its fulness it must wait for knowledges and apprehensions concerning the action of the Lord,—of the Divine Love as substance—in the universe, which are as yet lacking in clearness to our mental idea. And yet this doctrine of the bloods is the first doctrine which must be laid hold of in thought, as to the large generals of its construction, its nutrition, its operation, its power, its vitality, in order that we may understand even in the most far off image what this great phenomenon of organic form, vital and active, means,—this great phenomenon which surrounds us and of which we are actually part.

In the human form or organism there are three universal essences or bloods. *First*: The soul, human spirituous fluid, or human internal. *Second*: The animal spirit. And, *Third*: The red blood. (A. K. 509; *The Brain*, 89.)

"Three universal essences or bloods . . . have the government and edileship in the kingdom or city of the human body, namely, the soul (or human spirituous fluid), the animal spirit and the blood. The empire is so divided between this tetrachate, that the soul administers the supreme sphere, the spirit the inferior sphere, and the blood the ultimate or lowest sphere. The action and life of all is based and founded upon mutual conjunction, and upon the authority of the supreme essence or soul." (A. K. 513.)

"The soul, since it is a superior spiritual substance, receives influx immediately from God; but the mind, since it is an inferior spiritual substance, receives influx from God mediately through the spiritual world; and the body, being composed of the substances of nature, which are called matters, receives influx from God mediately through the natural world." (*Intercourse Between Soul and Body*, 8.)

"For the formation of the blood and its maintainence there is necessary terrestrial chyle, atmospheric chyle and etherial chyle. The passages by which the chyles respectively pass into the venous blood are



three,—the stomach, the lungs, and the skin. (I. E. A. K. 49, 50, 53, 60; see also A. K. 406, note 0, 509.)

“Man consists only of such things as are in the earth, and from the earth in the atmospheres. Those things that are in the atmospheres from the earth, man absorbs by means of the lungs and by means of the pores of the whole body; and the grosser elements, by means of foods composed of earthy substances. (T. C. R. 470.)

We will address ourselves then to the facts of nutrition as those relate to the blood, and the origin, nature and laws of the volatile spheres or radio-emanations to which the major part of nutrition is due. And after that we will take up the great office of nutrition, first to the man himself in fixing for eternity those forms of truth or of falsity to which his deliberate action and repeated effort are inclined; and, second, to those who are no longer living in the lower natural plane and yet who are organically bound up in one cycle of life with those of the human race who still breathe our common air; that is to say, to our unseen neighbors who have passed through that gate of life which we call death.

But preliminary to this we will first take a general survey of the three essences or bloods of the human form, as given in the writings of Swedenborg.

#### THE THREE SUCCESSIVE ESSENCES OR BLOODS OF THE HUMAN FORM.

FIRST. *The human internal, soul, formative substance, human spirituous fluid, the great universal human essence.*

In this the Lord immediately is universally present, in every human organic form.

This essence is framed from the Divine Celestial, the first aura,—that first atmosphere by which the Lord is universally and immediately present in His created universe of heaven and earths, to embrace, to govern, to form and reform, and to generate the human race.

SECOND. *The animal spirit, purer blood, middle blood, less universal essence, lymph, white blood.*

For the composition or bringing forth of this blood in actuality, like an offspring, two things, as it were parents, are necessary:

1. A portion of the first or universal essence to give as it were a soul from the Lord the Father of us all.

2. Etherial chyle, that is, purest and finest particles and spheres dissolved in the ether or floating therein. These are the mother stuff that form the body of the animal spirit. They are invited and imbibed through the invisible mouths of the skin. They are carried directly to the gray nervous substance or brain cells, and their selection and admittance is governed by the human internal or soul, or—to use the full statement,—by the Lord immediately bodied in and operative through the soul or human spirituous fluid; and this to the end that the Lord may keep the state and quality and power of this purer blood or animal spirit in correspondence with such marriage of love and wisdom,—or of the converse,—as, from hour to hour, the voluntary and self-conscious planes of man freely strive toward and act toward. See *I. E. A. K.*, 55-57; *A. K.* 406 and note o, 509, 156, 405 note b; *Div. Love and Wisdom*, 423, 420; *Div. Wisdom*, X, 6; *T. C. R.* 470; *S. D.* 1738, 1035; I *Adversaria*, 1457.

The finer lymphs of the body itself constitute the serum or liquid in which the living discreted globules or units of this animal spirit float.

“The prior, purer or pellucid blood is actually the very lymph that the lymphatic vessels absorb and carry back through the thoracic duct into the red blood. In an absolute sense indeed the purer or pellucid blood is the animal spirit which floats in its serum; wherefore the former kind of blood, that is, the spirit, is in like manner beset and surrounded by a serum, but of the most refined and delicate character and properly termed lymph. For it is prepared and fed in the same manner as the red blood, but on the purest or etherial elements.” (*A. K.* 510 note e; see also *The Brain*, 90, 445j, 511-2, 92.)

THIRD. *The red blood, ultimate blood, common and lowest essence.*

This blood also has a double origin, that is, it is a soul and a body as one integral form. It is an offspring of

1. A portion of the second blood or animal spirit, given to be its soul or father, and



2. Its adjoined body or mother materia made up of spheres and food-substances from two sources:

The first source is the chyle of the plane of the ærial elementary or fourth aura. This consists of floating ærial connectives or salts of a triangular, block form,—that is to say, “acids,”\* given off into the air chiefly by the vegetable kingdom along with the transpiration of water vapor from its leaves, and which constitute the first member of the sulphur family, *i. e.* oxygen. The mouths which take them in are in the lungs, and they themselves are the specific lung food by means of which venous blood is changed into arterial in the lungs. (*A. K.* 407 note s; *Red Blood* (in Posthumous Tracts), V; *Chemistry*, XI, § 9 *a priori*; *A. K.* 406 note d. 509.) This first source also consists of those floating spheres of things, primitives and oils, and all that are called odors. (See above references and also 3 *Doc.* 768-770.)

The second source is the terrestrial chyle, and it is expressed from the food in the stomach.

The red blood thus lives from its contained portion of animal spirit,—its paternal factor,—just as the animal spirit lives from its portion of the soul or supreme spirituous fluid. (*Brain*, 644.)

“Many sciences are included in that of the blood, namely, the whole circle of anatomy, medicine, chemistry and physics, and even of physiology.\* For the passions of the mind vary according to the states of the blood, and the states of the blood according to the passions of the mind. In a word, the science of the blood includes all the sciences that treat of the substances of the world and of the forces of nature. For this reason we find that man did not begin to exist till the kingdoms were completed; and that the world and nature concentrated themselves in him; in order that in the human microcosm the entire universe might be exhibited for contemplation from its last end to its first.” (1 *E. A. K.* 7; see also *Last Judgment*, 9, *Worship and Love of God*, 70 note o; *Divine Wisdom*, VI, 3.)

The red blood is a complex substance comprising in itself the simples of every degree (*A. K.* 202, note h). And, therefore, for its maintainence in integrity and equilibration-fulness

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\**Chemistry*, XI, § 9 *a priori*.

\*The Latin of the original is *physiologicam*, but the context would seem to indicate that this is a misprint for *psychologicam* (psychology).

of use, it is necessary that there be conveyed into it four things: 1. Food converted into chyle conveyed through the stomach, intestines, and lacteals. 2. Atmospheric aliment conveyed to the lungs and through the lungs to the blood. 3. Most subtle etherial aliment conveyed to the bibulous layers of the skin, and through them to the blood. 4. Moreover, from every pore, vesicle and gland, aliment must be provided which has been repeatedly secreted, and which is destined for the little veins to swallow. (1 E. A. K. 199; see also A. K. 168.)

The first rule therefore is, that suitable food be procured, absorbed and conveyed through the body in the form of a liquid." (1 E. A. K. 199.)

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## THE SENSES.

TRANSLATED BY E. S. PRICE, A. M.

### *The Sense of Taste, or the Tongue.*

4. *In order that that sense may affect the animus and excite appetite, or extinguish it, etc.* [see No. 2:1]: With respect to these things we have to consider; 1. that every sensation runs from the papillæ through the fibres immediately to the cerebrum and cerebellum and their whole cortical substance. 2. This is what sensates, but not the organ or little sensories of the tongue. 3. That the cortical substance of the brain is affected according to the agreement with the blood of the things touching it; pleasantly if they are homogeneous, unpleasantly if heterogeneous. 3. The outmost or vaginal tunic of the papillæ carries the ruder sensations to that cortical substance of each brain, and that indeed by an arterial way; to the end that they may concur. 4. The sensation also runs through every fibre, membrane and structure of the tongue, and in an instant communicates every contact of the sensation. 5. Our sensation of taste is only an affection, wherefore no idea of it is left in the brain, as is the case with the modes of hearing and the images of sight. 6. The brain is affected ac-



according to the state of its organ and the parts thereof ; 7. and the organ is affected according to the state of each brain ; 8. wherefore also according to the state of the mediating fibres. But as to the single points :

*That every sensation runs immediately through the fibres to the cerebrum and cerebellum:* Wherefore, 1. the papillæ are the ultimate forms of the fibres, consisting of fibres, to which they are attached, according to Malpighi ; for instance, a similar mode to that which touches the fibres, passes into the fibres ; 2. not only into the fibres, but also into the animal spirit which runs through the fibres ; for the fibre and the percurrent spirit actuate the same cause, the former a passive and instrumental cause, the latter an active one. 3. The spirit and the fibre are of an elastic nature, and they carry through the whole force which they receive all the way to their extreme ends, just as other elastic bodies, air and ether, that is, the atmospheres, almost in an instant ; according to experience. 4. Wherefore those sensory fibres are rather soft, so also the fifth pair, according to the authorities ; therefore they are more tumid with spirit, and are more sensitive ; for there is nothing in them which does not flow, as it were, in its own manner, and which is not mobile in each of its points. 5. From contact a similar tremiscence instantly arises in the fibre, and a similar modification in the spirit, wherefore a similar representation in the termini of the fibres ; how slight a touch produces a mutual effect in bodies slightly elastic, likewise in elastic membranes and nerves, is well known, because it happens similarly in those which entirely correspond with the touch. 6. Every fibrous composition expanded into the papilla corresponds to its papilla which is everywhere various in the tongue, wherefore the composition of the fibre is also various. 7. The modification itself thence arising is called sensation, when to the modification is added life ; for sensation is modification in which is life, in which again is spirit, and finally, in the cortical substance where it is in its first cause, resides the soul. 8. Sensation not only pervades the fibres, which are continued to the papillæ of touch, but also pervades all the fibres with which it is in connection, wherefore the whole medullary substance,

both that of the medulla oblongata and that of the cerebrum and cerebellum. This is evident from the nature of the tremiscence and modification in hard things and in the atmospheres, also from the perpetual connection, also from the nature of the sensation, that the whole cortical substance must participate in it. We will see that the brains and the cortical and medullary substance participate in it. 9. Every sensation pervades the cerebrum equally, where it becomes sensation, as well also the cerebellum; wherefore the fibre of the cerebrum which is of the ninth pair, and the fibre of the cerebellum, that is, that of the eighth pair, are joined together everywhere in a mutual anastomosis, and the nerve of the fifth pair which springs from another origin, and is both soft and hard, also acts as a uniting medium; for the nerve of the fifth pair arises from both the cerebrum and the cerebellum. 10. Thus the external organ of sense, whether it be of taste or of smell, whether of hearing or of sight, does not sensate, but is only an instrument for receiving a contact, and for carrying it to the sensory; for that alone sensates which [is] organically [constructed] for applying sensations to itself, also the diverse states of the change to be suitably put on, therefore although there is only one force, [yet] the very organic form brings it about that it is such as it is, and not something else. [II] This is apparent from those organs when injured, dissected, etc., when their fibres are separated, and from phenomena of the brain and its diseases, from sicknesses of the animus; this [condition] instantly feigns a sensation in the organ; hence the fallacies of the senses delude us. 12. The more distinctly all things act in the tongue, in the fibre and in the brain, even so that every single fibre is distinctly left to itself, but limited to the general, the more acute, distinct and perfect are sense and affection, the better likewise are the very organic forms arranged in part and in the common pact, as is evident in the smallest reptiles, in the earliest years, in adolescence, in the well; it is otherwise in the sick, in the worn out, in the aged, where the simple fibres coalesce and do not exercise their own right, but breathe only what is general.

*That the outmost or vaginal tunic by the arterial way like-*



*wise carries sensation, but a ruder one, to the brain.* These things are to be considered: 1. That the vaginal tunic consists of mere arterial ramifications, as is the case with most of the membranes in the body, as also in the brain (which will be demonstrated in the work on the Brain), wherefore they are of a passive disposition. 2. The inmost tunic consists of the corporeal fibres of the arteries, these fibres terminate in the cortical substance. The vaginal tunic of the tongue consists of this inmost tunic, and through the carotids creep swiftly up to the cortical substance of each brain. 3. This tunic weaves the cortical spherule itself, and finally unites with the fibres thence springing forth; of these things elsewhere. 4. Thus a concourse of sensation takes place in the cortical substance; on one side through the arteries, on the other side through the fibres; therefore indubitably a change of state; thus every sensory, likewise as from an internal cause, also from an external one; thus the active and the passive concur in one effect. 5. That the carotid artery pervades the whole brain, even to the cortical substance, is to be indicated, and that its ramifications also form the sheaths of the bundles of the fibres in the medullary substance of the cerebrum and cerebellum, this also comes to be demonstrated. 6. Thence also the tongue, like a stomach, immediately brings aliments to the spirit of the brain; this is sufficiently clear and well proved by effects.

*That the cortical substance of the brain is affected according to the agreement with the blood of the things touching it.*

1. For such as is the soul, such is the spirit; such as is the spirit, such is the blood; such as is the blood, such is the chyle; such as is the chyle, such are the organs; therefore all things ought to be acceptable to the nature of the soul, which is various in every kind of living thing, wherefore also the structure is various. 2. This is called the order of its nature, for the soul has respect to the blood as to its vicar in the body, that is, in the ultimates of its world. 3. This is the reason that animals which live subject to nature, know the nature of their food from instinct alone; it is otherwise in the human race, which is ruled by its own will and the principles of its

own mind, into which the regimen of nature has been for the most part transcribed. 4. If the parts agree with that nature, they are gladly snatched up, they blandish, they excite and affect pleasantly; if otherwise, as what is contrary or heterogeneous, it affects sadly, it is unpleasant, it is rejected, for it is repugnant to nature. 5. Wherefore this sense pronounces what is good and what is bad for the blood, or for the corporeal life; that which agrees is good, that which disagrees is bad; every sense discerns good and evil, under an appearance of delight or undelight; 6. but whether a thing be true, that is, truly good, or truly evil, or falsely good or evil, this does not find place in man, but is left to his art and science, whence is the medical and many physical arts; and these things must be explored by effects; but animals have this as something inborn in them, for they are ruled by nature not by reason, which must be cultivated by a posterior way. 7. All science is *a priori* in the soul; the senses are its indices; wherefore it instantly apperceives, and from its nature appetizes or loathes; this arises from the love of its body, this fact constitutes a sound vicar in a sound body. 8. But in order that it may learn intimately, it invites many senses into consociation, namely, smell, sight, etc.; a kind of blind appetite also teaches us what conduces to the blood, if only our reason have been in some manner separated, and so that we can be wholly led by nature, which is then operative. 9. But we cannot describe that correspondence, and the harmony thence arising, and their affection, until we have reviewed the whole animal kingdom, its cortical substance, the blood, the spirit, the soul, the fibres, the brain, indeed also the doctrine of forms, of influxes, of correspondences; thus in the meantime it becomes necessary to speak in words not well understood.

*Sensation also runs through every fibre, membrane and structure of the tongue, and in an instant communicates every mode of sensation.* 1. Therefore the papillæ are inrooted in the inmost basiliary membrane. 2. This membrane itself is fibrous to the end that every modification may continually propagate itself. 3. In particular this is as follows: it is re-



ferred to the general in order that it may be anything, and may be set in order, and may be elevated and exalted to sense, as in some instruments. 4. Whatever happens to one [fibre] must be communicated to all. 5. Therefore the papillary form must communicate within itself. 6. Therefore the horns or cartilaginous parts are inrooted in that same membrane. 6. [a] Therefore the supreme membrane also receives the sensation of one [papilla] into the whole general membrane. 7. Therefore all the fibres of the tongue carry away every mode of sensation to every cortical substance of the cerebrum and cerebellum. Therefore all the fibres communicate, as well those of the fifth as those of the eighth and of the ninth pair. 9. Since the sensation is in this universal membrane, and in its own general, it is also immediately in every motor fibre, in every gland, in the whole structure of the tongue; each thing receives that mode according to its organism. 10. The mode goes in the direction of the antecedent parts of the fibres; thus also the fibres communicate. 11. Thus the parts of an organ are arranged by external causes, then also by internal causes, that is, by the brain; external and internal causes ought to concur. 12. Indeed sometimes the change of state, that is, the affection, precedes the external causes, whence habit passes over into nature, as when a fibre is hurt or punctured, from its nature it instantly contracts, while on the other hand, when it is tickled, it expands; since this [condition] is in every point of the fibre and its spirit in which is the life, there is no part of it but fears its own extinction. 13. Hence in respect to every single mode of every sense and organ the parts concur with their own mode; hence is sensation.

*The sensation of taste is only an affection*, for 1. We do not feel how [an article of food] pricks, hurts, how many are the spicules, what things are flat, what spherical, how they are joined; for to sensate that, is sensation itself; 2. but only how the organ is affected, pleasantly or unpleasantly, sweetly or bitterly, hot or cold; for it is every little sensory which does the carrying to the common sensory, that is, to the cortical substance. 3. There are infinite varieties and particulars which affect one fibre, there are infinitely more which affect the

different fibres; from composite humors reduced into one common mode by the membranes and communications, arises sensation which then is only affection. 4. It is otherwise in the sensories of hearing and sight where single things are represented, from which distinctly conjoined in their form an affection results. 5. This is the reason why the ideas of the modes of taste and smell cannot be impressed upon the memory in the same manner as can the modes of sight and hearing, wherefore neither can they be similarly reproduced. 6. For the affection itself cannot be reproduced unless we can compose all the modes into a grateful form. 7. But we reproduce the affections themselves by thought of the object, that is, by ideas. 8. Therefore every variety of sensation is a variety of affection, because the general does not sensate the particular; as, for instance, colors, the forms of the parts of which are so arranged, that they may be affected thus or otherwise, under this or that color. 9. If we conceive of affection alone, we conceive of only an occult quality, and a general, obscure and indistinct idea; myriads of forms concur in every single affection, and simulate one form. 10. The soul alone knows sensations, for thence it produces affections; if it did not know them, whence could there be an affection, whether [sensation] took place or not? the idea results from the form of the part and the compound. 11. We must inquire into what affection is, elsewhere.

*The brain is affected according to the state of its organ,* that is to say: 1. from the particular state of the papillæ; 2. from their state in general; 3. from the state of the membranes; 4. from the state of the fibres. 5. For they are only recipient and deferent organs, and of themselves feel nothing. 6. This is evident from the state of the tongue, its papillæ and membranes, that is, whether the state be hurt, sick or sound, in respect to the natural structure or contingent variety. 7. Thus the brain is deceived by the fallacies of the senses; for it receives in the same manner as [the modes] are brought to it. So it occurs in the other sensory organs in the extremes.

*The organ is affected according to the state of each brain.*



1. If the brain is sick; 2. if its animus is affected. 3. If the mind persuades itself that this would be suitable for the blood, it therefore appetizes it and loves that which hurts. 4. Hence is the appetite for unsuitable things, for medicines, for pains themselves; for the mind has respect to the health of the body and the restitution of the blood; thence it is evident that a similar harmony occurs when nature indicates foods suitable for the body. 5. But the rational mind is deceived, not so the soul which is above the mind.

*Also according to the state of the mediating fibres;* that is to say, 1. of those fibres which communicate sensation to the brain, 2. of those by which the brain communicates with the organ, 3. by which the papillæ communicate with the extremes, with the common membrane, with the motor fibre and with the tongue. 4. This is evident to the life in every change of state from the change alone of the fibres, for they are media. 5. Therefore it is ultimate causes, that is, in the organ itself, mediate causes in the fibres, and inmost causes in the brain, that is, in the cortical substance, which produce affection, and finally change of state, of which we must now treat.

5. *From affections arise changes of state, for sensations are changes of state according to affections.* 1. Changes of state are various, yea, universal, as are affections and sensations. 2. The sensory is the more perfect the more distinctly it can undergo many changes of state, and the more suitable are the states of the parts for the general state. 3. According to the modes of the sensations and the affections thence arising, a change of state is instantly induced upon the papillæ, because upon the fibres, and upon the brains. 4. A similar state is induced upon the whole sensory organ and its parts; 5. likewise upon every appendage which performs any work for the same office, and acts as a servant, whence, upon the glands. 6. Then further a similar state is induced upon the palate, œsophagus, stomach, intestines and the rest of the viscera. 7. The change of state itself is especially induced by the cerebellum, as by inmost causes. 8. It is also induced contingently by external causes which affect the tongue, as by disorders of the blood, fluids and salivas, or the injury of its

structure. 9. It is also induced by mediæ causes, that is, by disorders or affections of the animus. 10. There are permanent changes of state which pervert the sense, and there are natural changes according to the affection of the aliments.

*That the changes of state are various, yea, universal, as are the affections and sensations,* for, 1. every affection induces its own change. 2. The species of affections are as many as are the species of sensations. 3. They are named according to excellence; the affections which are of the animus, resulting from the forms of material ideas, that is, imaginations, 4. all induce their own changes; but changes cannot be explored without the doctrine of forms, of order and of degrees, also of influxes, for influxes are different, wherefore affections are of a different order, and hence also changes of state are different. 5. Changes of state take place in the same degree as [their corresponding] affections. 6. They are indeed innumerable, but can be reduced to a few; they can be reckoned as intermediate and subalternate, that is to say, *first*, changes by contractions and expansions, *second*, by variations of figure, *third*, by hardenings and softenings, *fifth* (*sic*), by heat and cold, *sixth*, by vital tumefactions, or by quiescence, for in all kinds of changes the entire system trembles from a certain innate force; to say nothing of other changes. 7. These changes attack the fibres and the animal spirit, wherefore that whole texture, which is composed of fibres. 8. Hence changes arise in the compounds exactly according to the form of their composition, as in the papillæ and muscles.

*The sensory is the more perfect, the more changes the organ can undergo successively and at the same time, and the more conformably the changes of the parts correspond to the change of the whole,* 1. as in the sensories and motories, that is, in the organs and muscles. 2. The more complicated and delicate is the tongue or any other organ, the more perfect it is. 3. The more distinct are the parts, the more changes can they undergo. 4. In tender age all things are most distinctly divided, afterwards they grow together, and thus the faculty of changes of state perishes, hence there is a loss of life, both sensitive and motory. 5. For in tender age the sensory can be



accommodated to all things, can be longer and more wholly consociated, remaining more permanently in its own essence. 6. Thus the papillæ in the tongue, the fibres, glands, motor fibres, hence all correspondence and all natural observation and ends or uses are distinctly put forth. 7. Thus the modes are varied, the essence remaining permanent; thus the more the modes and the more distinct, the more perfect the effect, for the harmonious and corresponding varieties are more.

*According to sensations and affections changes of state are induced upon the papillæ and nerves of the brain, for 1. if anything unpleasant touches or pricks the fibre, it contracts; 2. if pleasant, it expands. 3. It grows hot or grows cold, or trembles or becomes quiescent. 4. The spirit itself undergoes these changes sometimes without the [participation of] the brains, as in cadavers but only that of contraction or expansion, whence there is motion of the muscles, for I doubt many changes without [the participation of] the brains, yea, rather the soul comes into consort where she resides in her own purest organism. 5. Wherefore the papillæ have been so made that they can be extended into pyramids and threads, contracted into spheres, can change their figure, can withdraw themselves deeply into the sinuses of the tongue, can stretch themselves out for contact; 6. they can close their pores lest that which is hurtful should enter; they can grow hard, soft, cold or torpid; they can present a vital tremiscence in, as it were, a flaccid connection. 7. This also can be experimented upon in tongues, the papillæ of which after death fall down and can afterwards be very easily converted into all forms. 8. That state comes especially from the cerebellum according to the affection of the cerebrum; for change of state descends through the fibres, sensation however ascends thereby.*

*A similar change of state is induced upon the whole sensory organ and its parts; that is to say, 1. upon the papillæ, wherefore upon the papillary congeries; 2. upon the glands; 3. upon the membranes on which they rest; 4. upon the muscles. 5. All things concur to this end; 6. for while the papilla contracts, the gland also contracts, and does not admit humor; the*

muscle also contracts, wherefore the whole organ in general undergoes a similar change; 7. indeed also the fluid parts, which flow within the vessels, as also the blood; 8. for the change descends from the cerebellum along the nerves.

*A similar change is induced upon every appendage, which performs some service to the same end;* that is to say, 1. especially upon the salivary glands, which in expansion and delight pour out abundant saliva, as the parotids, the maxillary, the sublingual, and the buccal glands. 3. The glands of the tongue open and draw in; 3 [a] the larger hiatuses and such-like glands similarly. 4. The muscles vibrate quickly. 5. Thus they confirm the states of motion and the states of substance which mutually correspond to one another; it is otherwise if there be another change, because there will be another affection.

*A similar change is induced upon the [palate], the œsophagus, the stomach and the intestines.* 1. This is from causes not only of the sense of taste, 2. but also from causes of the sense in the stomach and intestines, where also are found the serico-villous papillæ. 3. All of these the cerebellum commands through its sympathetic nerves, through which it pours in its own changes according to every economic law and co-establishment or order. 4. Sense is the admonishing cause.

*Sensation is induced especially by the cerebellum.* 1. This governs mastication through its sympathetic nerves. 2. It perceives through their states what it is that affects. 3. It belongs to the office of the cerebrum to sensate; 4. hence there is an allotment to the cerebrum and an allotment to the cerebellum. 5. Changes of state depend upon the cerebellum, for they are not governed by the will. 6. Motions of the muscles are changes of state from the natural; the cerebellum resists them. 7. But those muscles, which the nerves of the cerebrum do not approach, are subject to the cerebellum. 8. There are many motions of the tongue which are not governed, but follow, as it were, in a continuous series, according to the advertence of the sensations.

*Sensation is also induced by external causes, as, 1. by diseases; 2. by a sick state of the blood, by abundance, by a bad*



constitution; 3. by an abundance of fluids and by their bad disposition; 4. by the solid parts themselves growing together, or by injuries, 5. by the nerves themselves. 5 [a] They change the natural structure, and take away the faculty of acting distinctly. 6. Wherefore by these induced changes the brain sensates and is affected and that indeed fallaciously; for there are preternatural changes. 7. Finally, there are faculties of changing state according to nature and the structure.

*Sensation is induced by affections of the animus*, as by anger, fear, envy, etc., are induced other states; there are states superinduced; these being admitted, the rest of the states follow; but the sense of motion, the salivas, the appetite and many other things undergo a certain alteration.

6. Hence are the effects, which are the nutrition of the blood, and of the corporeal life, the preparation of the chyle, indigestion and many more.

It is to be observed, 1. That sensation ascends to the brains along the fibres; 2. that affection exists in the brains; 3. that change of state descends through the fibres into the organs; for as [sensation] affects all the beginnings in the brain, so it affects the fibres themselves, wherefore, so it effects every organism constructed of fibres.

Sensation is the very beginning of life and the all of its faculty and activity, all the rest flow from sensation; for the sensation in the external organs is similar to the sensation in the internal organs, so that he who understands the mode of action of one will perceive the rest; the same contingents, attributes and modes occur on both sides,\* but with a distinction which is as between the prior and the posterior, simpler and more compounded, more perfect and more imperfect; let a comparison be instituted: 1. Sense receives its object by a posterior way, thus taste, smell, hearing and sight, so the internal sense, that is, the understanding by its organs or by the ideas of its memory. 2. The external sense turns those things which it receives this way and that, applies them to itself on all sides, and thus explores whether a thing is suitable; and the internal sense likewise revolves and turns ideas, and thinks [about them]; this is especially called apperception and altera-

tion. 3. The external sense is affected by things revolved and turned, some it expunges, some it adapts to itself, and changes its state suitably, so that it may receive them in such manner that they agree; likewise the external sense from thought expunges those things which do not agree and *vice versa*; thus it forms its understanding and conclusion, which it chooses according to the affections. 4. Next those things which the sense, as taste, appetizes; as the appetite is enkindled so also the internal sense desires, and thus reunites it into the will. 5. The external sense induces suitable changes of state, so also the internal sense desires, and thus remits it into the will. 5. be altogether suitable to the sensation of the state, 6. just as the sensation of that state which is the principal produces the state of motion which is altogether suitable to it, and adapts itself: thus sense is the cause of the motion, and of its agreement between sense and motion; for those things follow in the same series, both inmost in the brain and in its internal sensories, and in extremes, that is in the body.\*

\*Following the end of this paragraph, and forming the last lines of the MS., come the following words, which, however, are crossed out by the author:

7. This is the rule concerning every sensation: that the soul sensates, our mind is affected and thus sensates the affections, and that—

[THE END.]

## THE FIBRE.

### CHAPTER XVI.

THE SPIRAL FLUX OF FIBRES; AND IN GENERAL HOW FORMS ARE EXALTED BY DEGREES INTO MORE PERFECT FORMS.

**255.** *The essence and nature of the simple fibre must be thoroughly explored if we are to have a profound understanding of the causes of the effects and phenomena occurring in the animal kingdom. According to what was indicated just above, n. 252. To this end enquiry must be made as to what is the form of the fluxion or motion of simple fibres, what that*



of medullary fibres or those which arise from simple fibres, and finally what is the form of the fluxion of bloodvessels; for the fact that bloodvessels are derived from fibres will come to be demonstrated in the sequel. From a knowledge of the form of the fibre comes a knowledge of its essence and nature; for essential determinations are that which is called form; and from its form comes the ability of the fibre to act in this manner or in that, that is to say, to be such as it is, yea, even to be. Because, as was said above [n. 252], our concern is that we come to a knowledge of the essence and nature of this fibril; for neither essence nor nature is explored apart from form. "Form (according to Wolff) is that which we call essential determinations. He understands the form of the human body who understands not only its structure and hence the figures of its organic parts and the manner in which they are inter-joined, but also the combination of similar parts whence organic parts are composed." (*Ontologia*, § 944.) And further on he says, "That an entity can act in a given manner is from its form; hence the scholastics affirm that form contributes operation to thing." (*Ibid.* § 946.) "Form therefore is the beginning of an entity upon which depends the existence of such an entity; consequently it is a cause of the entity." (§ 947.) And Aristotle says, "Every single thing is to be called a thing by virtue of the fact that it has a form." (*De Nat.*, Lib. III, Cap. i.)\* Thus the truth is confirmed that the quality and mode of action of an entity depends on its form. Wherefore an entity without form would be devoid of all quality and mode of action, and thus could not be anything. I speak of the entities of nature, and not of those which are above nature, such as the spiritual and the divine; for with respect to these neither quality nor mode nor accident can be predicated except by supereminence.

**256.** *But we cannot come to a knowledge of the simple fibre except by the analytical way, that is to say, by progressing*

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\*We are unable to find this specific statement in Aristotle, though there is no doubt that it expresses the philosopher's teaching. Can any of our readers assist us?

from visible phenomena through the connection of causes to invisible, or from bloodvessels to medullary fibres, and from these to the simple fibre; for the latter is far removed from the senses, and is the inmost or supreme fibre of its kingdom. Afterwards, when by the analytical way we have arrived thus far, we may be permitted to descend thence by the synthetic way.

257. [FIRST] *As regards the form of the fluxion of bloodvessels,—both those which are called arterial and those which are called venous,—this form is absolutely circular, nor do they strive into any other form. For their muscular tunic which presses on the enclosed sanguineous stream and pushes it forwards is woven of annular fibres or muscular circles densely compacted together. See Transaction I, n. 182-186. Every constrictive force of this tunic strives from so many peripheries to so many centres, which latter constitute the middle axis. The blood globules themselves, which are rolled down within a tubule of this nature, are also circular in figure; and moreover are circularly rotated around their axis. According to the ocular experience of Leeuwenhoek, who says, “When I examined blood in which was a quantity of chrysaline liquor, and carried the little tube [wherein it was contained] to a place where the wind was blowing, I observed that the globules were set in motion, like the air itself, by concussions and also mutually among themselves; and moreover I observed in the globules another kind of motion, namely, that each globule gyrated round its own axis.” [Philosophical Transactions, n. 106, p. 129, 130; Trans. I, n. 29.] Thus the tunic of the arterial vessel is altogether conformed to the nature and mode of the fluxion of its fluid, (see Transaction I, n. 134, 135, 522), and both conspire to the circular, that is, to the spherical form of motion. Hence is clear, what is the form of the fluxion or undulation of the sanguineous volume within the arteries; namely, that it is similar to that in waters,—a fluxion or undulation which widens out through continued circles from the beginning of the motion to its ultimate bounds. See Transaction I, n. 166-176.*

258. [SECOND] *As regards the form of the fluxion of the*



medullary or nerve fibres, this is not simply circular, but is a form superior to the circular and to be called the *perpetuo-circular*, or, properly speaking, the *spiral*. For whenever a fibre is loosened from connection with the neighboring fibres and left to its own law of fluxion, it twists itself after the manner of a spiral, howsoever stretched out it is into a kind of line when held bound up in a bundle of many fibres,—the case being not unlike as with a twisted silk thread. But since, as I have indicated above, we must pass to a knowledge of the simple fibre by the analytical way or the way of experience, it is necessary that I establish the spiral flux of this fibre, as I have previously established the circular flux of vessels, by ocular testimony; otherwise, it will seem perchance like a hypothetical assumption. There are indeed many of the learned who recognize this fluxion of the fibres; but Leeuwenhoek by his observations has proved it beyond a doubt. See his figure 7, [n. 34, above], which he describes as follows: "Although I had no doubt that the nerve fibrils, howsoever fine they might be, were so formed as to be accommodated to the making of contractions and expansions, nevertheless I wished to investigate this formation and see it with my own eyes. I therefore made longitudinal sections of various filaments of little nerves, and by aid of the microscope I had one of them delineated, as shown in fig. 7, where it is marked MNOP. In this figure the vessels which serve for carrying down the juices of the nerves, so far as they are extended lengthwise, are seen to be convoluted into *spirals* or *gyres*. It must be supposed, however, that in every extension of the nerve these parts stretch their gyres out into a straight line. By MN, OP is designated the tunic which, as I have shown, is surrounded with its several nerves." [n. 33.] Elsewhere, the same author says, "When I separated from each other those parts of the nerves which perform for them the use of vessels, I saw them *convoluted and curved into spirals after the manner of snakes*." [n. 39.] "I carefully cut out two filaments hardly thicker than a double thread such as is used by tailors, and no longer than a finger-joint. When I examined their other extremity I found nothing there except certain little parts mutually *convoluted* and

*contorted*. At various points lay two or three filaments mutually involved and complicated, with only a little interjacent matter. Nor was I able to bring to mind the probable cause of this convolution, although I had no doubt that the filaments used in this examination were truly nerves." [n. 31.] It will be of use also to here bring forward what the same author mentions as to his investigations with respect to the contorsion of tendinous fibres: "I placed under the microscope (he says) a minute portion of a tendon cut straight or longitudinally, and I clearly recognized that the tendon was compacted of six or eight smaller tendons. In each of these tendons *the form was a spiral one*,—a form which, in the motion of bodies, seems to be especially adapted for contraction and expansion. Furthermore, I have had delineated a minute tendon [which was adjacent to the outside of the tendon just mentioned]. It is shown in fig. 17 by the letters KL. Here *may be seen the spiral parts, or parts revolving or rotating in a gyre*, and which lie on the tendon just like *the thread or edge on a screw*. And indeed nothing can be imagined more suitable for the exercise of expansions and contractions than this spiral figure and rotatable nature. Nor is that spiral figure and that form of circumvolutionary parts confined only to tendons, for neither is it wanting in the fleshy fibrils which are annexed to the tendons." [n. 42.] "After the parts of the tendon had been separated, we then recognized in them those small and *snake-like spirals*." [*Ibid.*] "In the legs of the flea I can most distinctly recognize not only tendons and fibrils, but *also the spiral and volutionary contraction of the fibrils*, which, as I can clearly discern, is also not wanting in the muscles of the flea." [*Ibid.*] "In the flesh of the wild bee also I have observed spiral extensions and contractions." [*Ibid.*] I have desired to here adduce the observations of this renowned author respecting the spiral fluxion of fibrils over tendinous fibres and motor fibres of muscles, in order also that thereby may be confirmed the following induction, namely, that the fibre when released from the bond of neighboring fibres, strives into no form more freely than into the spiral,—as for instance when fibres unfold themselves in muscles and elsewhere. *At its end*



where it enters upon the work of constructing its organic forms this fibre loves to flow around into no other form more freely than into that of an helix. Likewise in its cortical gland whence it issues, and which, being most perfectly convoluted after the manner of a screw, carries on its expansions and constrictions in no other way; hence a similar effect redounds to the fibre which is produced therefrom. Thus, as is the weaving in the principle such is the web brought forth therefrom. This fibre flows from the cortical gland like a thread released from a twisted coil. But as regards the gland itself, the keenness of the sight, even when armed with the microscope, cannot indeed penetrate so far as to be able to distinguish the simplest threads of its texture; and yet I deem that it cannot be denied but that these threads are disposed in most perfect order and in accordance with every mechanical potency of nature. On these matters consult also Transaction I, n. 301, 302, 303. Thus then, not only from the experience of things visible but also from the connection of causes, this phenomenon is rendered indubitable,—to wit., that the cortical gland, in respiring, expelling fluid, and producing fibre, makes spiral gyres. *The fluid itself which courses through this fibre all the way from the cortical gland to the end, seems to wind itself, both as to parts and as to volume, into the form of a similar gyre. For a tunicle is exactly confirmed to the nature of its fluid, and a fluid to the mode of reaction of its tunicle; since in this way and no other do tunicle and fluid act together as one cause.*

259. [THIRD.] *As now regards the form of fluxion of the simple fibre which produces the tunicle of the aforementioned compound fibre, this form cannot be simply spiral but must be superior to the spiral. For as forces and substances are elevated by degrees, so they are elevated into a superior and more perfect nature and potency. So likewise with this form of fluxion, which therefore merits to be styled the perpetuo-spiral, which in the following pages we will call the vortical. Just as the circular form when it is elevated into a superior form is called the perpetuo-circular, or more properly, the spiral, so this form is called the perpetuo-spiral or vortical;*

for what is superior must also be designated by another name,—according to the fourth rule laid down in Transaction I, n. 648. *And since this fibre is likewise transpirable and pervious and carries a certain purest essence proper to the animal, and which at the same time constructs the highly delicate membrane of the fibre itself, therefore from the connection of these same causes it follows, that such essence,—if it be compared with a fluid,—when it courses through the fibril, winds itself, both singly and in general, into gyres of a similar spiral; and this by virtue of the same law, namely, that fluid and tunicle are most exactly conformed to each other, and unless the one together with the other be understood, there is no fibre. Consult n. 253, 254.*

260. *But because the essentials and formals of this fibre lie deeply hidden within visible nature, therefore it is not to be wondered at, if the mind also, which is a superior sight and is enlightened by the light of its external senses, here begins to grow dull, and, as it were, blind, or to enter into a kind of shade, that is to say, to be ignorant as to what the perpetuo-spiral form is or what its nature, and hence to be doubtful as to its existence. To this end therefore, I wish to ascend from the most imperfect form to the most perfect, to the end, namely, that an idea of the one, that is, of the more perfect, may be acquired from a perception of the other or more imperfect by the aid of elevation from power to power; just as in the case of the infinite calculus; for thus we acknowledge, even though we do not comprehend.*

(To be continued.)



# THE NEW PHILOSOPHY.

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## Editorial Notes

The present number of the NEW PHILOSOPHY is devoted almost altogether to the presentation of Swedenborg's DOCTRINE OF FORMS. This has been done in order that the doctrine may be presented to our readers for study as a whole, and our present number may therefore be regarded as a brochure on this important subject. This has necessitated the postponement, to our January issue, of the 3d installment of Miss Beekman's PHYSIOLOGICAL PAPERS, but we hope to make up for this omission in the future.

For some months past Mrs. William H. Benade, who has come to America for this special purpose, has been engaged in collecting, classifying, and copying all letters and other documents bearing on the life and labors of her husband, the late Bishop Benade. A large number of such documents are preserved in the archives of the Academy of the New Church, and these have been placed at Mrs. Benade's disposal. But there must be many other literary remains of the late Bishop in private and public hands; and since it is Mrs. Benade's desire to make her collection as complete as possible, she earnestly requests the co-operation of all who are in possession of documents suitable to her purpose. The utmost care will be taken of any that may be entrusted to her, and they will be returned without unnecessary delay.

Of the value of the collection as an important contribution to the history of the New Church there can be no question, and we would urge upon our readers the co-operation requested. Letters or other papers which of themselves may

seem of little value may prove to be of more importance when taken in connection with other documents ; it is advisable, therefore, to let Mrs. Benade be the judge of their value. Communications should be addressed to Mrs. William H. Benade, Bryn Athyn, Pa.

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#### PROPOSED REPRINT OF THE "ANIMAL KINGDOM."

Following the publication of the Work on Generation, DR. BOERICKE, the Vice President of our Association, now authorizes the editor of the NEW PHILOSOPHY to call for subscriptions for a proposed new edition of Swedenborg's work, THE ANIMAL KINGDOM. It is not proposed to make a new translation or even a revision, as this would involve too much labor and delay. What is proposed is simply to reprint the translation by Dr. Wilkinson originally published in two volumes in London, 1843-4, and since reprinted in America. The work is now exceedingly rare and is practically unobtainable.

The reprint by Dr. Boericke will be undertaken PROVIDED THERE BE 200 SUBSCRIBERS, AT \$8.00 FOR THE TWO VOLUMES. The work will be published within two years after commencement of printing and will be sold to non-subscribers at not less than \$10.00 for the two volumes.

Subscriptions should be sent to The Editor, NEW PHILOSOPHY, Bryn Athyn, Pa.

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#### THE DOCTRINE OF FORMS.

In various of his works Swedenborg frequently refers to "our doctrine of forms;" sometimes also he gives a brief sketch of this doctrine (*Senses*, 268; *Wor. and Love of God*, 24) ; and sometimes he correlates it with his doctrine of modifications (*Sens.*, 269 seq.) and of the human organism (*Rat. Phychol.*, 486; *W. L. G.*, 93). But nowhere is this doctrine presented in its entirety, or even in any degree of fulness, except in the chapter, or rather the treatise, which is incorporated in the work on the Fibre.

The doctrine itself has hitherto received little attention at the hands of students. An understanding of it is involved in



Miss Beekman's COSMOLOGY and in her work on the KINGDOM OF THE DIVINE PROCEEDING; moreover, in NEW CHURCH LIFE for 1911-1912, Professor Odhner has published an extensive collection of all the leading references to this doctrine made by Swedenborg in his various writings.\* But with these exceptions the doctrine is hardly referred to in the literature of the Swedenborgian world. Yet an understanding of it is evidently necessary to any full comprehension of Swedenborg's cosmology and physiology. The very fact of his so frequent references to it for clearer understanding is sufficient evidence of this, to say nothing of the internal evidence which must suggest itself to every student of Swedenborg. The doctrine of the auras with their forms and motions as given in the PRINCIPIA cannot be understood, except in the most general way, without the doctrine of forms; and the same may be said of the teaching respecting the animal spirit with its wonderful fluxions and gyres, and still more of the teaching respecting the spirituous fluid or soul.

The doctrine of forms is in reality the doctrine of the human form,—a doctrine illuminating our conception of the human form by elevating it above the mere idea of the human figure presented before the external sight, and introducing it to those superior forms which determine themselves into, and finally appear before our sight as the human figure.

The brain is in the human form, and indeed more perfectly than that kingdom which is governed by the heart and lungs. The inmost of the seed is still more perfectly in the human form. But while this is true, it is also true that neither the brain nor the inmost of the seed are in the human form as it appears on the angular plane into which they are finally determined. The brain and the seed are not angular forms,—

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\*This collection includes also the greater part of the chapter on Forms in the work on the Fibre. The translation is a revision of a MS. translation made by Professor Vinet, and we gratefully acknowledge the use we have made

of it as the basis of the present revision. For the benefit of those who possess the work in Latin, we might note that several of the references to Aristotle have been corrected by the present reviser.

though they are still human, and most perfectly human, as may be manifest from the fact that when unfolded by clothing themselves with matter they stand forth before our eyes as the human form. The form of the soul, which is from the Infinite, (says Swedenborg), is spiritual. The form of the intellectual mind is celestial or heavenly. The form of the animus is infra-celestial or vortical, and is the highest of purely natural forms. The form of the common sensory or brain is spiral (as is indeed evident to the sight). The form of the blood is circular. The form of the bones and of matters which serve to embody the blood and other humors is angular. (*Rat. Psychol.* 486, *W. L. G.* 93.) But all these forms are nevertheless human forms, each on its own plane.

The human form is essentially a form whose essential determinations go from centre to periphery and from periphery to centre,—a form whose centre is simultaneously in the centre and the circumference, and in every part at the same time. The supreme manifestation of this form is the created universe itself where the Divine proceeding from God the Creator ever goes forth to the ultimates of creation and returns to Himself by the founding of the angelic heavens. This is the form of that supreme aura in which the universe is founded and which is the soul of the universe, present in its every part both within and without. It becomes manifested on the plane of matter in ever increasing perfection of view in the mineral, vegetable, and animal kingdom, until it reveals itself in infinite fulness in man, the image of God. Its perfection is also seen in the whole of nature when nature is viewed as to uses; for then nature also is seen to be in the human form. In the same supremely human form is the soul of the microcosm or man, which is the only living thing in its body.

But in order that the supreme human or Divine form may thus descend to ultimates to be there manifested to human view, there must be created, or if you prefer, assumed, successive forms or successive accommodations of the first form. It is to the study of these successives that Swedenborg here introduces us, and the more fully we enter into that study the greater will be the opportunity of approaching to a deeper comprehension of the human form itself in its very essence.



We might note in conclusion the closing words of the paragraph in the work on the Fibre which immediately precedes the presentation of the doctrine of forms, and wherein is indicated the path along which we are to proceed in arriving at a comprehension of the doctrine itself: "I wish to ascend from the most imperfect form to the most perfect (says our author), to the end that an idea of the one, that is, of the more perfect, may be acquired from a perception of the other or more imperfect by the aid of elevation from power to power,—just as in the infinite calculus; for thus we acknowledge, even though we do not comprehend (n. 260).

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## Reviews.

### THE NEW EDITION OF "GENERATION."

THE ANIMAL KINGDOM CONSIDERED ANATOMICALLY, PHYSIOLOGICALLY AND PHILOSOPHICALLY. Parts IV. and V. on the Organs of GENERATION, and the Formation of the Foetus in the Womb, after which follow Chapters on the BREASTS and the PERIOSTEUM. Translated from the Latin by Alfred Acton. 398 pages. 8vo. With 10 anatomical plates. Cloth, \$3.00, *net*. Postage, 20 cents. Philadelphia. Boericke & Tafel. 1912.

This is most emphatically a wonderful book. That a man, writing in the year 1742, upon any subject in the domain of science, should have had the foresight, sagacity, and knowledge to make his book vie with the science of the year 1912 is certainly remarkable; but that this book, even at this late date, should be unsurpassed for acumen and philosophical insight into the subject treated is more than remarkable;—it is most emphatically wonderful. The truth of this contention will be readily perceived by anyone acquainted with the science of physiology who will make even a cursory examination of this antipue work, which has just appeared in a new translation.

In this, as in most of Swedenborg's scientific works, the method of treatment is to take the anatomical description of the parts from the anatomists of the day,—Winslow, Heister,

Boerhaave, Schurig, and others,—using these as a basis for the author's analytical deductions, or "inductions," as to the physiology of the whole organic mechanism. After a careful reading, and with a full appreciation of the precise experimentation of the present day, we are prepared to express the belief that its equal is nowhere to be found in the literature of science.

Every part of the book is impressive; it becomes doubly so if the reader is acquainted with the authors of the present day; and we assure the readers of the *NEW PHILOSOPHY* that it is well worth buying and well worth studying. It is based upon fundamental truths that can never be subverted, overturned, or outworn. A clear proof of the unfortunate lack of true general principles in modern science is the fact that the issue of a new scientific work often renders obsolete whole shelves of books scarcely ten years old, but the book under review belongs to a class that can never be made obsolete by new discoveries. Swedenborg's scientific works in general are the only ones in large libraries upon which the revolutionizing scientific discoveries made since 1895, beginning with the Becquerel rays, have had no disturbing effect. Swedenborg, not by observation, but by pure reasoning, discovered the existence of hydrogen thirty-one years before Cavendish actually isolated it, and similarly oxygen thirty-nine years before Priestly isolated it. In the same way there is not a new fact in the deluge since 1895 that does not fit into the stupendous philosophical scheme built up by Swedenborg in his massive works.

A brief comparison of some details of the work on *GENERATION*, with a modern work on the same subject will indicate that these statements are not exaggerated. The tenth (and latest) edition of Landois' *Physiology* gives the anatomical forms and chemical constituents of the seminal fluid, a most minute anatomical description of the ovum, the mechanism of erection and ejaculation, and of the reception of the seed, with the consequent impregnation of the ovum. But it presents an idea of this intimate organic and vital process as mechanical as that of the plumbing of a house where water and waste are



conveyed through metal pipes. This is followed by a treatment of the visible changes of cleavage, and the steps that lead up to the first rudiments of the embryo; then by chapters on the epiblast, hypoblast, and mesoblast, the order of which, so fruitful in Swedenborg's mind, suggests nothing remarkable to this advanced physiologist of the present day. The cold description goes on to the fully-formed foetus, devoid of any illuminating insight into the laws which by analogy and correspondence connect this beautiful mechanism with all other processes of nature. Because the Fallopian tubes are open avenues or ducts for conveying the ovum to the womb, Landois can see no other mode or way for the entrance of the spermatozoa, although he confesses that the motion of the cilia tends to convey bodies inwardly only. Swedenborg immediately perceives that nowhere in the animal body does one tube or duct answer for movement in opposite directions, and consequently he finds a new mode for the ingress of the seed to the ovum.

Swedenborg perceives in the inmost of the seed an offshoot or derivation of the soul as the active center necessary to the formation of a new being, an inmost that is far too subtle and too fine to effect its function unless properly clothed. In the chapters devoted to the Testicles, the Epididymides, and the Vasa Deferentia, this elaborate process of clothing with suitable coats is fully and convincingly described. Thus ensnathed, the seed is fitted for its function, and guarded against the loss, destruction, or dissipation of the volatile inmost,—fitted for transmission to the female organs, where it is received in such a manner that the successive parts through which it penetrates, exquisitely adapted to the office, successively remove the coats with which it has so far been clothed. One by one they are stripped off, until the pure seminal principle is delivered to the ovum about to be impregnated. Thus the seed is covered by the male and uncovered by the female,—not to mention the numerous particulars that cannot be recounted within the limits of a review.

This beautiful process, lying at the inmost of the life of man, if well mastered by the understanding, will aid in the

comprehension of many other processes in nature. A plain correspondence is seen in vegetable seeds. The inmost of this seed, like that of the animal, is too delicate and fine for exposure to the elements of this rough world, and therefore, according to its quality and needs, must be suitably clothed with coats, husks, and shells, adapted to the rough handling of the elemental forces,—rain, frost, hail, cold, water, and heat,—even until the time comes when it is delivered to the womb of the great fostering mother, the earth, which disintegrates, rots, and destroys the coats, and thus prepares the seed for the germinating influences of the soil's moisture and the sun's heat. In this marvellous economy of nature we view also a correspondence with what takes place on a higher plane. An idea of thought cannot be communicated from one mind to another without suitable clothing, first with a sensual image by the imagination, and then with the spoken word by the vocal organs. Thus enswathed, it can be transmitted through space to the ear of the listener, but before it can present itself to his mind it must be stripped of its clothing, first by the external and internal ear, and then by the resolving action of the faculties of the mind in the brain. The applications of this physiological process of generation are endless, stimulating the thought on many subjects, enriching the understanding, and sharpening the perceptions.

Examine, if you will, the description of the organs of generation as given in the most copious and detailed modern Anatomy, and the explanation of their functions as set forth in the most voluminous modern Physiology. Compare them with this book of Swedenborg's, and you will be impressed at once with the difference. You will find modern scientific thought on this subject materialistic, lifeless, and uninteresting in the presence of the wonderful insight, logical reasoning, clear observation, illuminating knowledge, and reverent attitude displayed on every page of Swedenborg's treatise. The mind of the reader is exalted as by a generous wine, and elevated into the sphere of the Providence of God, with a sense of sweetness and majesty.

Turning now to the translation itself, we may say that we



were surprised at first that a new one should be attempted, considering the well-known power and ability of Dr. J. J. G. Wilkinson as a translator and stylist. An examination showed, however, that the marked peculiarities of style that characterized all of Dr. Wilkinson's writings were not conducive to an exact and accurate rendering, which requires an entire submission of one's own peculiarities to the spirit and word of the author. The robust fibre of such a mind does not always lend itself easily to the genius of another. In every case in which we have compared the two translations there has been some advantage in favor of the new one, and we feel, no doubt, but that this will apply to the book as a whole. Reinforced by the great recent developments in the field of Swedenborg's philosophy, and by his own thorough mastery of the subject matter of this work in particular, Mr. Acton has given the work a new English rendering in which the exact meaning has not been sacrificed nor dignified beauty of style lost.

In both translations the first words of the Induction on the Spermatic Arteries,—almost the first in the book,—seem to us to deviate needlessly from the original. "*Quam mirifice*" may be rendered easily and naturally "How wonderfully," but in both versions it is translated by five words, "The wonderful manner in which." Noting this at the beginning, we were prepared to find many pleonastic expressions, but were agreeably disappointed, for in every particular paragraph examined we observed a close and graceful following of the text.

The preface is a valuable treatise in itself, and brings to view what painstaking research and exhaustive study the translator has devoted to his undertaking, as well in ascertaining the place occupied by *GENERATION* in the series of Philosophical works, as in consulting the original sources of the passages quoted by Swedenborg from the old anatomists. These are here and there expanded in the new volume, as an aid to the reader.

A word, too, must be said in praise of the excellent typography and handsome binding of the volume, and a word of warm commendation for the fine plates added in this edition.

Students of Swedenborg's Philosophy owe a debt of gratitude to Mr. Acton and Dr. Felix Boericke for their joint enterprise in bringing out this important work, and making it once more easily accessible to the English reader.

J. B. S. KING.

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BOOKS RECEIVED.

*The Bible that was lost and is Found.* By John Bigelow. New Church Board of Publication, New York. 1912. Pp. 120. \$1.00.

This work, which was originally written by the distinguished writer, traveller and diplomatist for circulation among his intimate friends, is deserving of high praise. It describes in eloquent and graphic language the "finding" of the Bible by the author himself to whom it had become a "lost" book. Nor is there any note of doubt in the full acknowledgment which is given to the Divinity of that revelation through Swedenborg in the light of which the "finding" was accomplished. The work will afford interesting reading to the Newchurchman, and it should prove to be of the greatest value to those to whom the Word of God is still a lost book.

*The Unveiling of the Spiritual World.* By the Rev. John Goddard. New Church Board of Publication, New York. 1912. Pp. 78. 35 cents.



“SAPIENTIA DIVINA SECUNDUM AEGYPTIOS.”

BY THE EDITOR.

“Divine Wisdom according to the Egyptians,”—such is the title of the work from which Swedenborg so frequently and approvingly quotes in the work on the Fibre and elsewhere. In these quotations the work is ascribed to Aristotle, and yet if the reader should wish to consult it in any of the editions of Aristotle’s writings, he would almost certainly be disappointed. Prior to the sixteenth century the work was entirely unknown, and by only one editor has it ever been regarded as a genuine work of Aristotle.

At the death of Aristotle in 322 B. C. his MSS. passed into the possession of one of his disciples by whom they were in turn bequeathed to a peripatetic scholar who carried them to Asia Minor. Here they were subsequently buried in an underground vault at Scepsis to escape seizure by the kings of Pergamus who, emulous of the Egyptians, were constantly, and not over scrupulously, on the lookout for additions to their royal library. About 100 B. C. these MSS.,—or some of them,—were unearthed and sold to a wealthy bookseller who carried them to Athens where, in 87 B. C., they were seized by the conqueror Sulla and carried to Rome. Here friends of Cicero edited and published them in an edition which has been the basis of all future authorized editions of Aristotle’s works.

It is certain from many conclusive indications that this edition did not include all of Aristotle’s writings, and that, consequently, (1) only a portion of those writings were concealed in the Scepsian vault; or (2) some were removed or stolen therefrom prior to the sale to the Athenian bookseller; or (3) the latter was given only a portion of the MSS. However this may be, it is certain that Aristotelian MSS. early found their way into Arabia. In the Middle Ages, indeed, the writings of the Philosopher were almost unknown in the original Greek, and entire dependence was had on Latin translations made from Arabian versions.

It was in an Arabic version that the MS., *DIVINE WISDOM ACCORDING TO THE EGYPTIANS*, was discovered about 1517 A. D. The first distinct mention of this work occurs in a letter written by Franciscus Roseus of Ravenna to Pope Leo X. Roseus states that when in the celebrated library of Damascus, he saw a work on Divine Wisdom written in fourteen books. It was ascribed to Aristotle and was said to have been translated from the Greek by a Saracen scholar named Abedam. Under the direction of Roseus a rough translation was made into Italian,—probably for the private inspection of the Pope, for we hear no more about it. But almost immediately after the discovery by Roseus, and perhaps owing to it, the MS. was examined by another Italian, Peter Nicolaus Faventinus, who then translated it into Latin. But (to quote the words of a later translator, Carpenter) “Nicolaus had greater leisure than Roseus to examine the MS., but,—pardon me for saying it,—he was not well versed in Latin.”

Nicolaus published his translation at Rome in 1519 under the title *THEOLOGIA, SIVE MISTICA PHILOSOPHIA SECUNDUM AEGYPTIOS*. The work however seems to have attracted little notice, for Jacob Carpenter, an English scholar well versed in all Aristotelian literature, did not know of the existence of this book until 1559. Coming across it “by accident” in that year, he was at once struck with the “Divinity of the thoughts” contained in it,—thoughts than which, he says, “I know not whether there is anything in the old philosophers more Divine.” “The doctrine concerning God and the celestial intelligences, the first active intellect, the soul of the world, ideas, the immortality of our souls and the creation and administration of the universe, are so expressed in this work, that they not only far exceed Plato but in many respects are seen to square with those things of our religion which far exceed the light of nature and are most deeply hidden.” But, fearing lest the reader be turned away from this “feast of delicacies” by “the impurity of the words and the inelegant and slovenly language” used by the translator, Carpenter soon set to work to make a new translation “into more tolerable Latin, but without polish.” This “translation,” however,



was probably merely a revision, for Carpenter does not seem to have had access to the Arabian MS.

Carpenter's translation was begun in 1563 and, after many delays, owing to the civil wars of the time, was completed in 1571. It does not appear to have been published until 1619, when it was included in DuVal's edition of Aristotle's *Opera Omnia*, 2 volumes folio, Paris, 1619, under the title "The More Secret Part of Divine Wisdom According to the Egyptians." A second edition was printed in 1629, and a third and fourth (last) edition in four volumes, in 1639, and 1654. The edition used by Swedenborg was probably the third. No other edition of the work appeared until 1882 when Dieteric edited the Arabic text and published it in Leipsic. This was followed in 1884 by a German translation, which, so far as we know, is the last appearance of the work in print.

As to the authorship there is considerable question. That it was written by an auditor of Plato, there can be no doubt; for the author says: "Plato formerly delivered many things concerning the mind which we have heard from his own lips; but he did not commit them to writing,—otherwise the reader of this work might easily apprehend his mind." He then goes on to recite some of these oral teachings (lib. I, cap. 5). But was this auditor of Plato Aristotle or some other? Carpenter has no doubt that it was Aristotle, and he is greatly supported by the internal evidence of the work itself where reference is made to "our work *De Anima*" (lib. XII, cap. 10) "our work *De Coelo*" (lib. cap. 11) and "our work *Metaphysica*" (cap. 7),—all of which are well known titles of writings by Aristotle. Carpenter also adduces the testimony of Thomas Aquinas who says "that Aristotle wrote fourteen books on Separate Substances which books he had seen but which had not yet been translated into Latin, and that these books contained the explanation of many questions concerning God and the soul which do not seem to have been treated of with sufficient clearness in the *Physics* and *Metaphysics*." Carpenter also suggests that this work is that book *ON PHILOSOPHY* which is quoted by Cicero (*de Nat. Deorum*, l. I, cap. xiii, 33), but which is now lost. But, if the work be truly Aristotle's Car-

penter admits, that then "he who is called the genius of nature and is thought to have stopped at nature, treated also of Divinity to which the light of nature cannot come."

As already noted, Swedenborg invariably refers the work to Aristotle. Moreover, in a note found in 3 PHOTOLITHOGRAPHED MSS. 81, he writes: "Aristotle concerning Divine Wisdom according to the Egyptians, for I believe that it is his because it is so sublime."\*

As to the work itself Swedenborg, in the note just referred to, sums it up as follows: "Its fundamental position is, That God, or the Maker of things, procreated the intellect, the intellect the common animus, and this, nature. Thus He made the intelligible world and the natural or elementary world, which latter is ruled by the intelligible world by influx."

We pause here to note that the evident admiration here expressed by Swedenborg for the "fundamental position" of the DIVINE WISDOM, constitutes in itself a complete answer to those who charge Swedenborg with having, in his PRINCIPIA, deduced from the Infinite nothing but a material universe. Nay, it strongly confirms the opposite position, namely, that the first aura of the PRINCIPIA is the seat of the "intelligible world," and the other auras which spring from the natural sun, are the natural or elementary world which is ruled by the former by influx.

Aristotle, or whoever the author of the DIVINE WISDOM may be, himself outlines his work in the beginning of the first book as follows: In this work we enter into the contemplation of God . . . and we teach, (1) That in His power is contained the universe of nature and of time; that He is the author of all causes. . . . That He enlightens intelligences, and, by their means, the intellect, and by the intellect the common soul, which is celestial, by whose force is directed the nature of all things that come into being and die away; that all things

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\**Nam credo quod ejus sit quia sublimius est.* The word *nam*, however, is susceptible of the reading *non*, in which case the translation would be "I do not be-

lieve it is his because it is too sublime." But both the writing itself and the context rather favor the reading *nam*.



are perfected by Him without motion, and that the motion of all things is from Him and must be referred to Him; that all things of nature and essence, by appetite received from Him, are moved in Him and to Him. (2) We shall contemplate the intelligible world as that which presents the goodness of God. . . . (3) We shall also explain the common nature of heaven, which receives its faculties from the intellect. (4) Then we shall descend to sublunary things, and will enquire as to how the powers of heaven inflow into this part of the universe. . . . (5) Then we shall describe the affections of minds which are endowed with reason, both when they descend into bodies, and when they ascend therefrom. . . . We shall speak also of that part of the mind which is to be honored and adorned with the cultivation of the intellect, and which is not immersed in the cupidities of things fluid, nor infected with the sordid things of the body. Then of that other mind which is deformed and contaminated with various things." (lib. I, cap. i.)

The above quotation sufficiently indicates the profound nature of the subjects treated of in the *DIVINE WISDOM*, and a cursory perusal of the work itself convinces us that the principles which it teaches give clear indications of the wisdom of that Ancient Church which at one time flourished in Egypt and other countries. The book itself gives no indication why it should be called *Divine Wisdom according to the Egyptians*, but the reason for the title is probably the one we have just suggested.

The teachings are extremely abstract, and, to the modern reader, very difficult of apprehension. It may be, that the style of treatment gives us some indication of the nature of that wisdom which flourished in the Ancient Church, and something of which was still known to wise men at the time of the Lord's advent. To Swedenborg, however, these abstract teachings were full of suggestion; and we doubt not that a study of the work in question, will enable us to see more clearly the growth of those sublime doctrines which distinguish his philosophical writings.

No English translation of the book has ever appeared in

print, nor could a translation be well made without recourse to the Arabic; for not unfrequently the uncertainty of the meaning casts a doubt as to whether the Latin translator has correctly understood his author. In the meantime, it may be useful to present to the reader some of the more striking chapter headings of the work:

"All things were so made by God that although in unfolding them we use time, yet they were not created in time. (I, 7.)

"In the other world the mind understands in a different way than in the body. In the things which it understands it observes an order, but there is no time by which its thoughts are distinguished. (II, 2.)

"Why the soul, which in us is the beginning of reason and intelligence, descended from heaven into the body; and what enrichment it will carry from the body when it returns to heaven. (VII, 1.)

"A comparison of the two worlds briefly explained, in order to an understanding of how this inferior world is ruled by the power of the superior. (VII, 4.)

"On the conjunction of both worlds by the soul. (VII, 8.)

"Chapter five distinguishes a threefold condition of the human mind. (XI, 5.)

"In simple and compound substances degrees of dignity are distinguished from their relation to God, from whom all things flow by means of the Word and the Intellect. (IX, 6.)

"A comparison of the agent intellect and of the Word itself, with God, and with that part of the mind whereby we reason. (X, 11.)

"A comparison of the conceived Word with God the Author. (X, 13.)

"A further comparison of the Word with God and with the agent intellect. Thence is derived the first origin of the wonderful order existing between things of the universe. (X, 17.)

"Speaking on the agent intellect, as to how it emanates from God by means of the Word, the author first implores the Divine Deity without whom this subject cannot be comprehended by us. . . . (X, 19.)



"A confirmation of the immortality of souls. (XII, 7.)

"Why the knowledge of Divine and incorporeal thing is difficult to our mind, namely, because the latter is too greatly addicted to the senses of the body. (XII, 20.)

"How man, contained in the sensible world, is to be prepared and excited to the contemplation of the intelligible man. [? world.] (XIV, 5.)

"In the intelligible world the mind not only has intelligence and reason but also sensation, and this better than in the inferior world. (XIV, 6.)

"On the author of all things which are in the intellectual world, and on the Word itself and its relation to the intelligible world and its Author. (XIV, 12.)

"By what degrees we must ascend to a knowledge of the intelligible world and how this is distinguished from human knowledge. (XIV, 13.)

"A conclusion of all respecting the Creation of all things by the first Worker. (XIV, 15 and last.)"

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## THE FIBRE.

### CHAPTER XIV. (*Continued.*)

#### THE DOCTRINE OF FORMS.

**261.** *The most imperfect form, which is also the ultimate of forms, is the ANGULAR; and it consists of angles and interjacent planes, and is bounded by mere straight lines which are determined not to any common centre but to other directions. This is apparent in triangles, quadrangles, etc.; for if lines be drawn perpendicularly from any point of the planes they do not flow together or meet in any given centre, but perpetually intersect each other. In the circle, however, all lines drawn from the surface are concentrated in a single point; and if, by any external force or by pressure of the fingers, you wish to reduce a circle or sphere, wherein interiorly there is a determination and nature of this kind, into a triangular form so that it shall remain triangular, the determinations themselves must necessarily undergo change; that is.*

to say, the lines which converge in the centre or aim at the centre must remove themselves from the centre and look for their terminations to other points outside the centre,—in which points, moreover, they are met by other lines let down perpendicularly from another plane of the triangle; otherwise the form springs back into its own sphere. That straight lines thus determined do not produce any perfect form was also, I see, held by the Philosopher of old where he says: “A circle is perfect, but no straight line is ever perfect; for neither is it boundless, since it must have a term or bound, nor is any manner of things bounded perfect.” (*De Coelo*, lib. I, cap. ii.) And further: “Local motion in a straight line is not suited to nature;” for “motions which are effected in a straight line are opposed to each other by reason of their positions . . . since each single position is always distant from the other by a straight line.” (*Ibid*, cap. iii, iv.) *From the above it is apparent that in these forms the determinations are opposed or more or less contrary to each other, that is to say, meet each other more or less obliquely or directly; wherefore, at every point of section and meeting, the progression is stopped, the fluxion terminated, and the forces extinguished. Hence it comes to pass that such forms, in themselves and their own nature, are altogether unsuited to the continuation of motion, and are the verimost forms of rest and inertia. And by such meeting of lines there arises profound rest not only in the internal structure itself, but also among several forms when mutually applied to each other. For on their external surface they are in like manner angular, that is to say, are furnished with planes and angles,—for as is the essential determination such is the termination, or, what comes to the same thing, as is the form such is the figure which is the limit of the extense,—and angles are so many points of hindrance and planes so many points of coherence. For not one of these latter can be rotated around any axis, still less around any centre (which, indeed, they lack), since angles and corners impede; and if planes come together they are joined into one. Thus every angular form is to be conceived of as being intrinsically a coalescence of mere trigons or little cubes,—just like the mass*



in the larger effigy into which they coalesce when a number of them are mutually applied to each other in one space; for they cannot be rotated unless all the neighboring forms yield place. *Therefore these forms are the most imperfect and are endowed with the force of inertia. Thus they are proper to the earth, and are the same as those which are called saline, acid, alkaline, urinous, sulphureous, nitrous, mineral and vitriolic.*

[261A] *The triangle in planes, or the trigon or tetrahedron in solids, is the first and as it were the simple of angular forms; for to these, all the rest, howsoever compounded they are, refer themselves, and to these are they reduced if they are to be resolved. Of triangular forms the most perfect is the equilateral or equiangular, while the scalene are more or less imperfect. The quadrangle in planes and the octohedron in solids is the second of the angular forms, being compounded immediately from the first. Of quadrangular forms the most perfect is the equilateral and equiangular; the rest are more or less imperfect, such as parallelograms, rhomboids, trapeziums, or forms wherein the sides and angles are more or less unequal. After these come polygons and multilaterals, which in like manner are regular and irregular and consequently more or less perfect or imperfect; the last of these forms exceed all number. Thus angular forms are distributed into genera and species. "Since specific difference (according to the teaching of Wolff) consists of essential determinations, and by the same determinations is determined the genus and species of an entity, therefore it is by reason of its form that an entity belongs to a given genus or species and is distinguished from other entities." (Ontologia, § 945.) From these considerations it follows that the first of the angular forms are most minute tetrahedrons and octohedrons; which therefore are to be called elements, primitive entities, and the principles of salts and sulphurs. Compare Transaction I, n. 69-79. These, together with their compounds, are so many hard and inert corpuscles incapable of motion among themselves except by the aid of fluids; truly heavy, material, extended, figured; of themselves fixed and fixing; not expansible or elastic; frigid; tempering in divers modes the fluidity*

and heat of active forms; but most highly suited for the formation of various compounds. For without them neither earth would exist nor the vegetable kingdom nor the animal, nor, in a word, the visible world. These forms are what affect the sensories of taste and smell with so great variety; and they properly constitute that part in every animal which we call the body. These, moreover, are the forms of which geometry, trigonometry, physics and chemistry treat scientifically.

262. But lest we halt uncertain in the significations of words, it must be explained at this threshold what FORM is, and what FIGURE. Form is the essential determination or the determinate fluxion of parts, points, substances, forces. Thus we have the form of motion, the form of modifications, and the form of substances,—all of which forms coincide. Nevertheless no idea of forms can be conceived of apart from the idea of fluxion. Figure, however, is the limit of an extense or the termination of such fluxions, that is, the terminus of essential determinations. It is sometimes called external form. Meanwhile this definition of form is in agreement with ancient and modern philosophy. There are indeed essential determinations or forms of which neither terminus nor limit can be predicated, consequently neither figure,—such for instance as spiritual forms; but yet these predicates must be understood of such forms by analogy with things similar; or, they must be predicated by eminence; for termini and limits are not possible unless there are parts, and these must occupy space and must form an extense. But to resume. *External form is born after the image of internal form, but not the reverse. For if from an angular form the angles are cut off and the planes rounded, the form is turned into one that is spherical or more perfect; but the internal form still remains, that is, the former essential determination and the whole of the quality thence resulting and ingenerated. Furthermore, from the figure, when not changed, is known the quality of the form; as, from the countenance the quality of the animus.*

263. The next superior form is the CIRCULAR or SPHERICAL form wherein are no angles and no planes. For in order that angular forms may be elevated into this next



*superior or spherical form the angles must be cut off and the planes so rounded that no part of them remains; and therefore this form deserves to be called the INFINITELY ANGULAR or the PERPETUO-PLANE.* For it is an image of something perpetual or infinite relatively to that which in angular forms is finite. What is perpetual is also a unit; thus when there are no longer a number of angles nor a number of planes, there is in this form as it were one common angle or one common plane. This also comes about naturally when angular forms, in a volume composed of many such forms, are forced to turn about their axis; likewise when they are held by an engirding flame that licks them about; for the angles being then cut off, the forms are rounded, and with the help of nature are adapted to an axillary motion among their neighbors; moreover, the longer the motion persists, and the more swiftly, that is, the more forcibly they are driven around, the more are they liberated from the form of rest, as they put on extrinsically the form of a most perfect sphere. *But nevertheless there remains what is linear; for the semidiameters or radii are so many straight lines let down perpendicularly from the periphery.* Two kinds of lines are let down; for in the circle we must consider that as being upwards which is towards the centre, and that as being downwards which is towards the periphery; as is also the case in great spheres, such as our own, where the centre of the earth is in the lowest place. *Hence it follows that the spherical form is the verimost form of motion, and that it is most highly potent for resistance, most constant in remaining in its own essence, and, in company with angular forms, most highly accommodated to every ratio of composition.* But let us take these several points in order.

[i] THAT THE SPHERICAL FORM IS THE VERIMOST FORM OF MOTION follows from the fact that it is void of angles and planes, since angles are so many points of hindrance and planes so many points of coherence. For many spherical forms or globules rotate around their axis most freely in one volume and in one circumscribed place, nor does one move another from its place, nor touch it except in the least and a similar point; and after the contact it almost instantly recedes and rolls

away with the plane itself. Wherefore angular forms when put in motion and driven around among themselves, are turned as in a lathe by the mere force of the motion; that is to say, their angles being cut off, they are rounded, and with the help of nature are adapted to an axillary motion among their neighbors. Thus they are in the utmost readiness to gyrate around some axis,—for there are as many axes as there are diameters,—but not around a centre unless the linear directions are changed into circular and a spiral determination results. For in more perfect forms there is an axillary motion and a central motion, on which two motions depends the nature of fluidity, undulation and modification. Moreover, the smoother they are superficially the more fitted are they for the continuing of motions; while the rougher they are, the more unfitted. Thus such forms of motion are more or less perfect or imperfect. The very determination of the interior lines in the circle or sphere also conspires to making this form the genuine form of motion. For semi-diameters, like perpendiculars drawn from every point of the periphery, flow together into one and a common centre; nor do they meet each other at any other point on the way,—as is the case in angular forms, where the points of meeting are so many oppositions, and the oppositions so many causes of inertia, which are perpetual and infinite. From the confluence of the determinations to one single centre it follows that axillary gyration agrees with the form of nature herself; for there is nothing outside the centre that hinders the revolution, and each single diameter must represent an axis. That a diameter represents an axis follows not only from the fact that one diameter is distant from another, and that one is ever presenting itself as an axis, but from the further fact that the spherical form must be considered as consisting of mere concentric circles all the way from the ultimate periphery to the centre. For circles are formed if from any one point of a diameter perpendicular lines are projected, since these lines when simultaneously continued describe a line perfectly circular.

[ii] THAT THE SPHERICAL FORM IS MOST HIGHLY POTENT FOR RESISTANCE, or is resistance itself against all manner of



*external attacks and assaults, is evident from the fact that all the lines, like so many radii, meet in one common centre wherein is such absolute opposition, both as regards the several lines and as regards the whole of them, that one cannot be moved out of its place unless another is moved at the same time. Thus the forces are conjoined and the one protects the other lest they fall apart. This is the cause of the resistance in the spherical form, a resistance which decreases in proportion as there are more centres to which the determinations are diffused. As is the case in the elliptical or oval form wherein are two centres, and in the other curves wherein are many centres. For it is the regarding of the centres by the periphery,—from which the perpendiculars flow,—that measures the degree of resistance. In the circle, all the lines, or, if instead of lines we substitute forces, all the forces have regard to one single centre wherein they all meet together in every possible relation of opposition. For in this centre one line regards one other as diametrically opposed to itself, and the rest as obliquely opposed, and thus as opposed in every perceptible obliquity. Wherefore it may be said that there is nothing more inert, hard, resistant, and frigid than what is found in the centre of this form.*

[iii] *From these considerations it also follows that SPHERICAL FORMS ARE MOST CONSTANT IN REMAINING IN THEIR OWN ESSENCE howsoever the modes may be varied. For the determination of one line is most highly similar to the determination of another, nor can it be changed unless at the same time all are changed,—and to prevent this, one protects all and all one. For from the centre each single line regards and as it were contemplates the universal state of its form, and in the centre it perceives all that happens to a companion.*

*Granted then that the essential determinations in the circle or sphere are not the contained lines or radii, or hard corpuscles, but that they are innumerable smaller spherules and in these still smaller which are more perfect forms according as they reside more interiorly, it follows that an entire sphere of this kind, composed of smaller spheres enclosed in due order, is highly elastic and yields superficially to every inrushing or*

attacking force. For if the smaller spherules are most highly yielding, the larger sphere which is their total or complex cannot but likewise yield, that is, be endowed with the power of elasticity. Conceding then that spherical forms are most highly constant in their essential determination, it follows that from no accidental cause can such forms, howsoever they may be pressed upon extrinsically, be reduced from their spherical form or be transmuted into another, still less into an angular form; but that, whenever urged, they are compressed into spheres of a smaller diameter or dimension, and with the removal of the urging force they straightway relapse into their pristine expansion. Thus the variation of their modes consists in their suffering themselves to be constricted into a smaller spherical space but not into any oval form. Thus also they answer to every ratio of the invading forces, and, with a minimum loss of forces, react in the degree that they are acted upon. For the more the spherules become constricted the more firmly and hardly do they resist, and this until they have increased their resistance to the ratio of the forces acting from without. This follows from the rule that nowhere is there anything more inert, hard, and resistant than in the centre of such forms, and thus in other places in proportion to their distance from the centre. That the part of the atmospheres are such forms becomes manifest from the several phenomena observed in the air.

[iv] THAT SPHERICAL FORMS IN CONSOCIATION WITH ANGULAR FORMS ARE MOST HIGHLY ACCOMMODATED TO EVERY RATIO OF COMPOSITION is apparent from the fact that primordial particles, saline, sulphureous and mineral, are not simple angular forms but are mediate between the angular and the circular. For they are so many minute trigons and octohedrons exactly hollowed out to the convexity of spherical particles, such as water particles; thus they can be mutually applied to each other and be suitably united into a larger corpuscle. It would be otherwise if their sides were plane and not hollowed. That primitive entities or saline and sulphureous elements are hollowed out at the sides suitably to the convexity of water particles, has been shown throughout in



my treatises,—see also the whole of the first chapter in Transaction I on the subject of the blood; nay, that their genesis must be derived from water, that is to say, that they are born in the interstices of water, and consequently are formed according to every convexity of the water particles. Hence arise not only octohedrons but also trigons. This has persuaded me that no saline element is entirely plane on any of its surfaces, for in such cases they could never be associated with any spherical particles whatsoever,—neither aqueous, nor aerial, nor mercurial,—since the two would touch each other only at one point, and thus would not be applied, united, and made coherent. From this principle it undoubtedly follows that there was a universal ocean prior to the existence of the earth; and that the crust of the earth was made up of elements originating between the water particles in the way described. *Hence come oils, spirits; the red blood, white blood, and the other humors of the animal kingdom (compare Transaction I, n. 115); essential juices, tinctures; nay, even the more solid particles such as the sulphureous, saline, stony, crystalline, mineral; and all vegetations,—the elements whereof, which are in the angular form, could never coalesce without the presence of interjected globules and without mutual embraces or kisses.*

[263a] *Moreover the circular or spherical form is the measure and form of all angular forms, and thus as it were their universal type and complex. For without the aid of the circle, angular forms and figures can never be measured, still less be reduced to calculation. This follows from the fact that the spherical form is perpetuo-angular and infinitely plane; and what is perpetual and infinite must give the law to things changeable and finite, and judge them as to their quantity and quality. The superior form moreover is always prior; hence the angular form is produced by the circular, on which account this latter is its measure and form.*

[263b] *Of the circular or spherical form also, there are genera and species. The genera are either more or less perfect or more or less imperfect, and so likewise the species. For we have elliptical or oval forms; and cycloids, parabolas,*

hyperbolas, and numerous others both geometrical and arithmetical.\* All of these have been distributed by the illustrious Newton into their genera and classes. *The essential determinations of these forms are not indeed directed to one fixed centre but to several. Still the directions do not cross each other or approach from opposite quarters, as is the case in angular forms, but come together in a certain line or plane. These forms, therefore, are more imperfect and inert than purely circular forms, but more perfect and active than angular forms.*

264. *The form next superior to the circular, prior and more perfect, is the PERPETUO-CIRCULAR which is properly to be called the SPIRAL. For its determinations are not into continuous concentric circles, nor are they directed by means of radii or straight lines to any common centre; but they strive by means of continual spirals to flow towards a certain middle circle occupying the place of a centre, and towards its periphery or surface; through which circular surface they continue their fluxions, or strive to continue them, and from which, by means of radii, they look to the centre of their spheres,—just as in the perfect circle. Thus in this form there is again something perpetual and infinite relatively to the circular form, as in the case of the circular form relatively to the angular. For the spiral is as it were a perpetual circular fluxion,—a fluxion, namely, from each point of the surface, which is the limit of its fluxion, through a perpetual spiral winding, towards a spherule occupying the place of centre. Thus each spiral represents at the same time both the circle and the semidiameter, that is to say, the determinations of each. Thus the semidiameter is everywhere, and the circle everywhere, that is, it is perpetuo-circular. This fluxion is terminated, as was said, in a certain spherical surface in the centre; but the determinations never meet each other, but flow unanimously and with due obliquity into all points of that surface, and so continue the gyre. For when all the spirals terminate in a circular surface of this kind, it follows, that*

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\*In the Latin this passage is printed in italics.



if the central spherule consists of angular forms, it is movable around its axis; or if it consists of spherical forms, the latter flow around in a circular manner. This central spherule is not unlike our terraqueous globe floating in its atmosphere, which revolves about its axis and into the surface of which are determined as it were the continual spirals of the ethereal atmosphere. If we wish to explore more deeply into the nature of prior or superior substances it becomes quite manifest that those substances which by their fluxion describe this form are endowed with such a nature that they can flow in no other way,—as has been abundantly shown in my Philosophical PRINCIPIA, where also I have taken pains to delineate the very form of the fluxion. *Thus the spiral form enters into the circular, and by means of the circular form, it regards the angular not as actually existing within itself, but as potentially able to exist.* According to the proposition adduced above, to wit, that the angular form is produced from the circular, and that therefore the latter is the measure and form of the former. But the angular form is not produced immediately from the spiral, for this would be contrary to the nature of derivation, since singulars can be unfolded only successively. *For whatever is the cause of the cause is also the cause of the thing caused; and therefore the spiral form is the measure of the circular form, and thus the form of all the forms that follow.* “The forms of the supreme world (says Aristotle) were called by the ancients Exemplars, wherein, according to Plato, is seated the substance of things inferior.” (*Divina Sapientia secundum Aegyptios*, lib. XIV, cap. xiv.)

[264a] *This spiral form is a superior form of motion more excellent or still more perfect than the circular; or, it is the form of active forces. For here there is no concentration of determinations, but in the place where the spirals terminate there they are continued by circles. Here therefore we find some natural spontaneity.* For in this form, a fluxion once commenced is continued with so easy a potency as to be almost spontaneous; and that nature has inscribed this faculty, potency, and force into the spiral flux is clearly apparent from

the helix and screw in mechanics. That this form is a still more excellent form of motion is averred by Aristotle where he says: "Besides those bodies which are here and around us, there is another and distinct body, which has a nature as much more excellent, as the body itself is far removed from those bodies." (*De Coelo*, lib. I, cap. ii.) *For the circular form is voluble and rotatable only around its axes or diameters, while the spiral form is voluble and rotatable around a centre; which central fluxion or gyration is the same as a perpetuo-axillary or truly spiral gyration.* That circular forms cannot gyrate around a centre, or, that in such forms there is no central gyration but only an axillary, has been pointed out above. Therefore for the existence of a central gyration there is required a more perfect form, or a spiral. Meanwhile, the manner in which central gyrations are effected cannot be easily expressed in words nor represented by a figure,—though I have attempted to represent it in my Philosophical PRINCIPIA; for when we ascend above the circular form the ideas of our understanding enter as it were a kind of shade. But to resume. If the fluxions are continued around a centre or around some central globe, it follows that a spiral gyration is possible. It would be otherwise if they were terminated in some centre.

[264b] *Hence also it follows that this form is still more constant than the circular in remaining in its own essence.* The constancy in the circular form has been treated of above. For the more perfect are the forms, the more constant they are, since they approach more nearly to the perfection of primitive nature. Wherefore they undergo essential changes with difficulty, but accidental changes with the greatest ease; for the faculty of undergoing accidental changes is the perfection of their nature. See above, n. 242. That nevertheless these forms can also undergo essential change is evident from the fact that there are also genera and species of such forms. But when they have undergone such change, they can be restored to their own nature and pristine perfection only with difficulty. For the greater the difficulty of their undergoing change, the greater the difficulty of their being restored; so



that in the case of still higher forms they cannot possibly be restored, that is, cannot possibly return,—on which matter we shall treat more fully below. To resume.

[264c] *This form also has its genera and species; and the genera are more or less perfect or imperfect, and likewise the species. But terms and expressions are lacking whereby to distinguish them from each other according to their differences; for this form goes above the common understanding, because above ordinary geometry and its lines and circles, being placed indeed at the summit of this science. That there are many genera and species of spiral figures is no secret to geometers. This, however, is not the place to designate the several varieties by name according to generic and specific differences, that is to say, to enumerate the differences. For spirals may be designated as circular, elliptical, parabolic, hyperbolic, geometric, arithmetical, etc., since, according to the nature of the spiral, there is formed on the inside a central globule or nucleus consisting of one of the above mentioned forms, and to this the external form corresponds. Meanwhile, this form is obvious and conspicuous everywhere in nature and its kingdoms, since to it are due all the properties possessed by the circular form. Into this form flow the parts and volumes of the ether, and by its means they represent their modifications; so likewise in the animate body, the parts and volumes of the purer blood, and also the medullary and nervous fibres. See above, n. 258. In the vegetable and animal kingdom also they are frequently conspicuous.*

265. *The form next superior to the spiral form, prior and more perfect, is the PERPETUO-SPIRAL which is properly to be called the VORTICAL. The reason for this denomination is that such forms belong properly to the superior ether which constitutes the great vortex around our earth, and within which also the moon performs its orbits and periods. I am not unaware of what modern authors think respecting the existence of this vortex, but this causes me no delay since the actual phenomena fully persuade me that they can be explained in no other way. For its determinations do not aim, by means of*

*spirals, such as we find in spiral forms, towards the surface of some circle or sphere, but, by a mode of perpetual spiral which we call a vortical spiral, they strive to wind themselves towards some globule or gyre of a spiral form holding the place of centre,—and indeed towards its surface. The nature of the spiral, or of the vortical fluxion of spirals, can hardly be comprehended except by the pattern of a line composed of the circular line and of the spiral. For as the spiral line or fluxion is mediate between the circular fluxion and the rectilinear, so the vortical line and fluxion is mediate between the spiral fluxion and the circular. Whether the matter can be expressed in any other way I know not. By which spiral surface they continue their fluxions, or endeavor to continue them. For whether they continue them or endeavor to continue them it amounts to the same thing, since in endeavor are contained all the essentials of motion, and endeavor is the first and the last in every motion, and therefore is the actual existence and continuation of motion. And from which, by means of spiral radii, they have respect to the periphery of some circle or to the surface of a sphere,—precisely as in the perfect form,—and from this circle to the verimost centre of the sphere. There is a similar ratio between this form and the spiral as between the spiral form and the circular; and therefore I use the same terms, except that they are applied to the vortical form by transmutation. Compare the preceding paragraph [n. 264]. Thus the vortical form determines and enters into the spiral, and, by the mediation of the spiral, the circular, and again by the mediation of the circular the angular,—which latter is within the vortical form not actually but potentially. Thus is apparent how great is the removal of the angular form from the vortical; so that the latter regards the former from a distance as it were,—as existing within itself not actually but potentially; nor does it ever pass over into this ultimate form except by successive derivation. From which considerations it is apparent how great is the immunity of superior, prior, and more perfect forms from the injury of inferior, posterior, or, in themselves and their own nature, more imperfect forms. In relation to this form even*



the circular form begins to appear as imperfect. For in itself and its centre it contains the principle of rest or inertia and also of gravity; but not so the vortical form, and still less the yet higher forms of which we shall speak presently. *Hence the vortical form is the measure of the spiral form, and thus the form of all the forms that follow.* In each form there is a certain representation or exemplar, as the ancients called it, or, according to modern authors, a certain mirror or idea of all the forms that follow. For not the least thing can be derived from the prior into the posterior unless there be some image of that thing within the prior. To give to another something which oneself does not possess, or to produce something from nothing is contrary to nature; but that which is given is contained within the parent the more remotely according to its distance when, by successive derivation, it is unfolded.

[265a] *This vortical form compared to the spiral is a still superior and more perfect form of action and is rather to be called the superior form of active forces, or of that conatus which lies within active forces. For within this form there is no least trace of opposition, but a certain natural spontaneity.* The reason is because its radii or determinations tend to the surface of a highly active form, that is, of the spiral, and from this to the circle; thus its force of action increases in a three-fold ratio. *For the spiral form is able to gyrate around its centre, but the vortical can gyrate around as many centres as there are points in the periphery of the circle to which it has respect. Therefore the gyration of this form is to be styled a perpetuo-central, or, more simply, a vortical gyration. Hence also it follows that this form, compared to the spiral, is still more constant in remaining in its own essence.* In respect to this matter see the remarks on the spiral form in the preceding paragraph; the application therefrom follows of itself, since it is a series of consequences. *Nevertheless these forms, like the inferior, are capable of undergoing a certain essential change,—but only with difficulty; and the greater the difficulty of their undergoing change, the greater, after the change, is the difficulty of their being restored to their pristine perfection.* This is a consequence. For, supposing a substance of this kind

most constantly permanent in its form, the causes of change must by all means be such that the whole state can be essentially changed or perverted; such, namely, that not only is the spiral form, to which the vortical aims as to its centre, reduced to the genus or species of another form, but likewise the circular form, to which the spiral form looks as to its centre,—according to the proposition. Thus the very centre must necessarily be removed from its position and placed elsewhere. Therefore until this entire disposition is changed, that is, one form after another, no essential change is possible; and if it does take place, such change is necessarily in like manner permanent as was the constancy in remaining in its own form. But to resume.

[265b] *Of this form also there are genera and species, and the genera are more or less perfect or imperfect, and likewise the species. But here terms and expressions are altogether lacking whereby to distinguish them from each other according to their differences; for the idea of this form almost transcends the human understanding because it transcends geometry and its lines and curves.* Compare what has been adduced in the point above [n. 264], and make a simple application. And because the idea of this form almost transcends the comprehension, it follows that in unfolding and perceiving it we are, as it were, in the shade of a kind of ignorance. Wherefore, because we do not penetrate to this form, neither do we admit its existence in the nature of things; in other words, we class the things predicated of it as among paradoxes and conjectures. But no matter. There are innumerable phenomena which confirm the actuality of this form and its fluxion. In nature there is an infinity of things which can never be reduced in an intelligible manner to any geometrical or analytical calculus, and yet we are persuaded of their existence. Thus there are many things the existence of which must be confessed even though we be ignorant of their nature. Nevertheless the quality of this form can be comprehended only like other forms which come under the infinite calculus raised to higher powers and which we are unable to resolve either by lines or by spheres. To resume. *This form is obvious everywhere in nature and is seen from phenomena; for to this form is owing all that is*



possessed by the spiral form, consequently all that is possessed by the circular, and finally by the angular. For into this form flow the parts and volumes of the superior ether, which constitute the great vortex around our earth; likewise, in the animate body, the parts and volumes of the purest blood or of that highly fluid animal essence which runs through the simplest fibres; and moreover, the simple fibrils themselves. See n. 259. To these forms is due the marvellous iron-attracting faculty of the magnetic forces, besides many other phenomena occurring around the magnet. For it is an evident truth that such a form can in no way exist by the fluxion of substances of this nature, unless poles be assigned to it, and greater and lesser circles, just as in the great sphere; so that in any vortical form, least or greatest, there necessarily exists a certain pole, arctic and antarctic, with the idea of an axis, and, moreover, an equator, ecliptic, meridian, the colures,\* etc., which have been found by observation not only in astronomical bodies but also in magnetic. It is thus apparent that forms of this kind really exist in the universe of nature, or in the world. That the magnetic force and its *attractio ferri* (attraction for iron), as it is called, and also its declination and inclination, has its origin in some ether whose parts and volumes, larger and smaller, flow according to the description of this form, has been shown at sufficient length in my *PRINCIPIA*; nor do I pause in doubt, but am fully convinced that the cause can be derived from no other source. But now to a form still higher.

266. *A form superior to the vortical, prior and more perfect, is the PERPETUO-VORTICAL form which is properly to be called the CELESTIAL.* The reason for this denomination lies in the fact, that this form is the supreme of all natural forms, and constitutes that great expanse which is called the celestial\* expanse, and in Sacred Scripture, Heaven (Gen. I). It is also named heaven by ancient philosophers such as Socrates, Plato, Aristotle; and in common discourse we ourselves speak:

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\*The colures are the two principal meridians, being two great circles intersecting each other at right angles in the poles of the equator.

\**Coelestis* (from *coelum*, heaven), which here and elsewhere is translated *celestial*, might with equal correctness be rendered *heavenly*.

of the starry universe as heaven; but there are those who make a distinction between heavens. *Its determinations direct their windings by celestial spirals, like so many radii, to a certain vortical gyre holding the place of centre, and around this gyre they continue their fluxions; from which centre they have respect to the spiral form, and from this again to the circular, and from this to the angular. Thus the celestial form enters into and determines the vortical, by the mediation of this, the spiral, and by the mediation of this again, the circular, and so on. This celestial form is the natural principle of active forces, endeavors, and motions, and from it flow all other forces. For this form is the first and supreme of all the forms of nature, so that it might almost be called nature in her first infancy.* Respecting first nature and that order wherein one thing depends upon another, Aristotle has some fine observations, where he says: "Every natural form has in the supreme world some other and similar form corresponding to itself but more noble. . . . An inferior condition (or state, *ratio*) depends on another, and conditions of this kind are many and singular. But that which is singular depends on that which is universal"\* (*Div. Sap. sec. Aegypt.*, lib. XIV, cap. ix); and

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\*The following is the complete passage from which the quotation in the text is taken: "We finally conclude that every natural form has in the supreme world some other and similar form corresponding to itself, but more noble. For in this world form depends on matter, but in the other it has not the least such dependence; and the latter is an image of the other. Wherefore in that world also there are fire, air, water and earth, as there are also plants. But if anyone shall say in dispute that such things are not possible in the supreme world,—for the reason that if they are there then they are necessarily either vital or void of life;

but if void of life how can forms here have need of them? or, if they are called vital, how did such beings come into existence? we shall answer that plants there are vital because they also live. But in the plant which exists above that mind which is proximate to matter and is conjoined therewith, (sometimes the plant is here materialized), there is a certain nobler condition (or state, *ratio*) effective of life. The truth is that there is a different condition (*ratio*) in the plant that is superior and primary to the plant here, and more noble; for this inferior condition depends on another; and conditions of this kind are many and singular. But that



elsewhere, in the chapter on the different definitions of nature, namely: Nature is defined in one way as the genesis of things nascent. . . . Secondly, as that from which, existing in the interior, is born all that is born. Again, as that from which arises, in each of the things that are in nature, that first motion which lies within it by virtue of the fact that it is itself. . . . We say that as yet a thing has no nature if it has no appearance and form. Nature therefore consists of both these. . . . Strictly speaking, nature is the substance of those things which have in themselves, for their individual existence, the principle of motion. But matter is called nature by reason of the fact that it is susceptible of this motion. (*Metaphysica*, lib. V, cap. iv.) *This form is most highly constant in remaining in its own integral state, and if it is removed therefrom it can never be restored to all its pristine perfection.* According to the points mentioned above, namely: That superior substances are capable of undergoing essential change only with difficulty, and the greater the difficulty of their undergoing change, the greater, after the change, is the difficulty of their restoration to their pristine perfection (n. 265). To resume.

[266a] *The qualities which are predicable of the celestial form can hardly be expressed by terms or expressions applied to inferior forms, except by way of analogy or by eminence; for they transcend the common ideas of our mind, and even rational analysis and philosophy.* The quality of this form transcends the qualities of other forms. We understand the properties (*rationes*) of angular forms, and also of circular forms, in that they belong to geometry; but we little understand the properties of spiral forms, and scarcely at all,—indeed not even scarcely—those of vortical forms. When we have understood these, then certainly the principles of astronomy and the causes of magnetic forces will by no means be concealed from us.

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which is single depends on that which is universal. So from these considerations it seems to be brought about that our compound plant is a kind of branch of that

universal plant. Wherefore if the plant here is vital, much more does it behoove that superior plant to be vital, which is the primary and true plant."

If our reason, supported by mathematical and philosophical principles, stops here, what hope is left us of penetrating to the qualities and faculties of a superior form? We cannot express by adequate terms, nor even by figures, things into which we do not penetrate. From the roots of a given number or figure, extract by means of the infinite calculus roots, one after another to the fourth or fifth power; or raise them four or five times to higher powers; then unfold or resolve the equation, or demonstrate it by figures or in numbers,—a thing you will certainly never attempt. And therefore that which is thus extracted or raised is not perceived as to its quality, but only as to the fact of its existence. *Wherefore, if they are expressed they appear as paradoxes, to wit: That this form or substance is simple, and relatively to all natural forms and substances, a unit void of figure, extension, magnitude, gravity, and levity, and therefore not material. That in it nothing can be said to be above or below, or to be carried to a centre, or a surface, or along a diameter. But one and the same point in fluxion is seen to be set in the centre, in the radius, and in every part of the periphery, and in a thousand places simultaneously and successively.* If we reflect upon the nature of ethereal modification whereby arises the sensation of sight we find an image or likeness of fluxions of this kind, that is, similar phenomena and paradoxes. For a ray springs forth from every point of the object or objects, and through the stream and myriads of rays flowing from other objects, it passes diametrically, obliquely, or in a straight line, in every direction; thus one and the same ray here represents a centre, elsewhere a circumference, and elsewhere again a diameter,—nay, many, both simultaneously and successively. “It is necessary (says Plato) that that which receives forms of all kinds should itself be void of all form.” He calls this form “an invisible form void of figure and yet capable of all figures,—a form which is perceived with difficulty” (*Timaeus*, p. 50-51 in my copy\*). He is speaking of what he calls the One, or what Leibnitz calls the Unit or Monad, and Wolff Simple Substance. Plato calls this One also the First and Smallest (*Par-*

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\*The copy referred to is Stephen's edition.



*menides*, p. 153), and by it he means the nature of simple substance (*Ibid*, p. 166). "The One (he says) is in itself void of magnitude and of smallness, and it neither exceeds itself nor is exceeded." (*Ibid*, p. 150.) "The simple ens (says Wolff), has no parts, . . . is not extended, is indivisible . . . is endowed with no figure, . . . is void of size, . . . can fill no space; . . . in it no intrinsic motion is possible; to it can be attributed no properties which belong to a compound as such, that is, which are attributed to a compound by virtue of its definition." (*Ontologia*, pp. 673-679, 683.) But to resume. That such an entity is void of gravity and levity is thus explained by Aristotle: "The heavy is that which is prone to be borne to the middle, the light that which is prone to be borne from the middle, the most heavy that which is gathered under all other bodies which are borne downwards. . . . Everything that is borne upwards or downwards has either levity or gravity. . . . A body which is borne in a circle cannot possibly have either gravity or levity, for in no case can such a body, either naturally or preternaturally, be moved to a centre or from a centre. Local motion in a straight line is not in accordance with nature herself, for it was said that there is one local motion of every simple body" (*De Coelo*, lib. I, cap. iii). He is here speaking of the simple body, which he places midway between the infinite and the compound body. "Every body must be either simple or compound, and therefore the infinite itself must be either simple or compound." (*Ibid*, lib. I, cap. v.) So likewise with us. For I call this form, or if you prefer, this substance, simple because it is the first natural form; above it, is the infinite itself (as will be seen), and below it are compound forms or substances. Thus the divine essence which is above, is not to be called a simple form, since the name form is not suitable to it. This substance was called by ancient philosophers "the *prima materia*, which is moved with a motion that consists in receiving form;" and they said that "form is desired by it as eagerly as perfection is desired by that which is imperfect." That the wise spoke in this manner is related by the Philosopher in his SAPIENTIA DIVINA SECUNDUM AEGYPTIOS, lib. IV, cap. ii:

[266b] *Into this form flows the universe called heaven,*

that is, each solar or stellar vortex; likewise its larger and smaller volumes; and also its individual entities. That I use the words volumes and individual entities, as though they were compounded of parts properly so-called, arises from the fact that no other words offer themselves to me whereby the fluxions and determinations of this form, in that it is a form, may be expressed. We must therefore speak infra-naturally, but, as said above, we must be understood in an analogical way, or by way of eminence. "The reasoning (says Aristotle) is the same with respect to the whole and to the part; in both cases there is a similar agreement with reason," etc. (*De Coelo*, lib. I, cap. iii.) *For each such individual entity is an exemplar representative of its universe. Such is the internal form of each individual of the purest blood or first animal essence which runs through the simplest fibres; so that its form merits to be called celestial, for it draws its essence from the celestial ether or from primitive nature.* That this first substance arises proximately from those things in the universe whereon are impressed by the supreme deity the principles of natural things, and wherein, at the same time, lie the most perfect forces of nature, see Transaction I, n. 590-592, and Transaction II, n. 227. But to resume. *The phenomena which emerge from this aura or form, and reach our senses, are exceeding few; for they lie inmosty concealed in nature. Nevertheless the real existence of this form cannot be doubted; for without it there would be in the world neither vortical forms nor the forms succeeding thereto; neither, in the animal kingdom, could simple fibres have existence, nor those infinite marvels of nature which flow out from her inmost bosom and from the simple fibril and its purest essence, both immediately and mediately.*

267. *The form superior to the celestial form, prior and more perfect, is the PERPETUO-CELESTIAL, properly to be called the SPIRITUAL, and most far removed from the ultimate or earthly form.* Philosophers, ancient and modern, and also theologians call spiritual essences forms, which inhabit the heavens even as we inhabit the earth;\* in place of forms some

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\*See 2 E. A. K. 356, where these theologians are mentioned by name; see also n. 269 below.



substitute substance or power, and these they name spiritual substances or celestial powers. Therefore we do not transgress against accepted formulas of speech when, by way of eminence, I call the divine spirit spiritual form itself. For here, form and substance coincide, as will be seen in what follows. In relation to this form, angels also are called forms, such, for instance, as angelic forms; and our mind itself is said by the Philosopher to be the immortal and eternal form of forms; [*De Anima*, lib. III, cap. v, viii]; by which he understands the spiritual form. But angels and our souls cannot properly be styled spiritual forms, but rather more perfect celestial forms which, unlike those forms of which we have just treated, are created for the reception and influx of the spiritual form, to which also they are accommodated. Nevertheless they merit the name spirits, inasmuch as these forms, to wit, angelic forms and our souls, unlike the celestial forms of which the starry heavens consist, are images of the spiritual form; for they owe their operations to the spiritual form immediately, since, in themselves, they are inferior and posterior and are subject to the spiritual. But we shall see these points better illustrated in the following Transaction.\* *Above all created nature, and therefore incomprehensible, ineffable, inexpressible by the most sublime analysis of the human mind, form in the abstract, contemplating in their order all forms outside itself and at the same time in itself, in that they are perfect.* For if we progress by a series like the one we have just instituted it follows that the spiritual form refers itself to the celestial, just as the latter refers itself to the vortical, and so on to the angular, which is the last in the order of respects and representations. Thus it can be said that this form contemplates other forms both as outside itself and as within itself,—but within itself, in that in their own degree they are most highly perfect; for nothing of imperfection can come forth from that which is most highly perfect. *With which the material, the extended, the fluid, and whatever is terminable in nature, and therefore accidents and modes, have no com-*

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\*The Transaction referred to is *eration*, Acton's translation, *Pre-Transaction VI*, on the Soul or face, p. 8.  
 Rational Psychology. See *Gen-*

patibility; thus neither the terms whereby material things are expressed,—except indeed by supereminence; for it is above all predicates. Thus a more abstract speech, which may be spiritual and angelic, or a more sublimated thought must be used in expressing and determining the powers and essences of this form. Unless this form were flowing into the inferior forms the latter would neither exist, nor subsist, nor be moved, still less would they live, understand, and be wise. Thus this form is the principle of existence, subsistence, action, life, understanding, and wisdom.

268. But the perpetuo-spiritual form is the DIVINE form itself,—not properly a form, but pure essence, life, intelligence, wisdom, and most utterly abstracted from space, time, matter, figure, motion, change, destruction. On these points there is a consensus of opinion among philosophers, including the ancients, such as Plato who approaches the subject as follows: “The One is infinite since it has neither beginning nor end? It is infinite.\* . . . Therefore it is without figure, since it partakes neither of the round nor of the straight. . . . Nor can it be carried around in a circle” (*Parmenides*, p. 137, 138). *The creator of all things, the beginning and the end.* “There is a conviction in the souls of men (says Plato), that God is the commencement and the end of all things, and that his force and power efficaciously permeate all parts of the universe” (*De Legibus*, lib. IV†). “All things are full of the gods” (*Ibid*, p. 991.) *Far above nature, and outside of which are all things.* “The infinite (says Aristotle) is not that outside of which is nothing, but that outside of which is always something.” (*Naturalis Auscultatio*, lib. III, cap. ix.) Thus he wishes to make the world either coeval with the infinite, or else eternal. But he speaks according to the last

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\*This is the answer given by Parmenides to the question propounded by Socrates. The dialogue form of the original is not retained by our author in the rest of the quotation.

†We are unable to find this quotation in Plato. The nearest

approach to it which occurs in the work cited is, “God, according to the ancient tradition, who holds the beginning and the end and the middle of all the things that are, proceeds directly to accomplishment according to his nature.” (*De Leg.* lib. IV, p. 716.)



acumen of his perception; for the intellect is not capable of penetrating beyond or above nature, thus into the eternal or infinite; therefore he does not discriminate the one from the other. But, being better enlightened by the Scriptures, we know that these two, namely the divine and the natural, are utterly distinct. For the rest, he affirms that all things are below God, yea, even the elements themselves or simple substances. "All philosophers . . . unite in making subject to the infinite some nature or other of those things which are called elements" (*Nat. Ausc.*, lib. III, cap. iv). "The elements of material things are not matter, neither are they infinite" (*De Generatione*, lib. II, cap. v). "The element of bodies is that into which are divided all other bodies wherein it resides, either potentially or actually" (*De Coelo*, lib. III, cap. iii). *Thus incomprehensible. For in it is all that is perpetual, infinite, eternal, unlimited, holy; and it is the order, law, idea of the universe. This form inflows into celestial and angelic forms, and into our souls, by the mediation of the spiritual form and of the Word. But so many are the arcana, that it is better to be silent, to be lost in astonishment, to fear and adore, than to speak of this subject in a way not holy, that is to say, naturally.* Compare Transaction I, n. 296-298, and Transaction II, n. 265-268.

269. *In addition to the natural forms of the universe or world recited above, first among which is the celestial form, there are also other forms which are called vital and therefore also spiritual, such as angelic forms, and human souls and minds, as also the souls of brutes. For these forms are called spirits not only by philosophers but also by theologians,—both by the Fathers such as Augustine and others, and by their disciples;\* and this because they are partakers of life and likenesses of intelligence. These are posterior to the verimost spiritual form, inferior and more imperfect; and therefore they are without and below it, that is, are subject to it. These forms are created for and accommodated to, not only the beginning of motion but also the reception of life and intelligence by means of influx from the spiritual form. This point*

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\*See above, n. 267.

has been treated of at length in Transaction II, n. 241-271, and therefore I refrain from treating of it again. *On which account they are images and likenesses of its operations, and therefore are called spiritual forms. These forms descend into the ultimate world, and ascend therefrom, by a similar ladder and in a similar series as the forms mentioned above which are purely natural and, in consequence, relatively dead,—being neither participant of life and sensation still less of intelligence, nor capable thereof.* The manner in which they ascend and descend has also been copiously demonstrated in Transaction II, n. 272-291, and elsewhere throughout; for this is the very subject of our transactions. *And in respect to essential determinations and fluxions, they in every way emulate the forms of the universe or world, and so correspond to them that the one flows into the other in the most highly suitable manner. For instance, angular forms into the sensoria of taste and smell; the circular or modificatory form of the air, into the sensorium of the ear; the spiral or modificatory form of the ether into the sensorium of sight or into the eye, and so on. Compare Transaction II, n. 288-291, and elsewhere. So the spiritual form flows into the soul itself which is formed for the reception of its divine operation, whence arises its principle of life, and intelligence.* [Transaction II, n. 292.] For which reason I have ventured to style the soul or its substance the supereminent organ in its body. Compare Transaction II, n. 275. *Thus from the forms of nature, we learn the quality of the forms of life, the series of which forms is represented in the animal kingdom alone as in its microcosm.*

270. *In addition to the forms of the universe or world, or the forms of life, there are also forms of the vegetable kingdom and forms of the mineral kingdom; of all which forms there are genera and species, and genera more or less perfect and imperfect, and so likewise species. There are no other forms but forms of the world, forms of the animal kingdom, forms of the vegetable kingdom and also of the mineral. The forms of the three kingdoms are dependent on the forms of the world and correspond to them. Thus, from the forms of the world we learn the quality of the forms of its kingdoms, and the manner in which the spiritual form flows into them*



*immediately or mediately, to the end that all things may flow constantly from an end, through ends, to an end, in provident order.* Compare Transaction II, n. 267, 268.

271. *Such is the ascent of forms from the lower to the higher; nor is this ascent merely an ascent of forms, but it is also an ascent of substances, forces, modes, qualities, and accidents,—none of which would exist without forms. When we thus raise ourselves from inferior forms to superior, we are said to ascend into a superior, prior, more universal, simpler, purer, and more perfect nature, sphere, potency, world, aura or ether; nay, to superior heavens; but there is a higher and a lower region in each sphere. For we talk of a higher and highest, and also of a lower and lowest region of the atmosphere or air; and how far soever we ascend into this, we are still in the sphere of air. So also in the case of the other auras. Therefore a region cannot be said to be prior and more universal. In each degree, when forms are carried up by this ladder, something earthly, material, and finite is cut away and put off, and a certain celestial, perpetual, and infinite is superadded and put on. The perpetual and infinite in the circular form is the circle itself, since it lacks beginning and end; but there still remain in it semidiameters or radii, which, since they terminate in some centre, are finite. This finite is put off in the spiral form, since the radii of this form terminate in some circular surface which is of infinite fluxion. But since what is finite still remains, by virtue of the fact that the spiral in this surface is determined into another form of motion, therefore in the superior form this finite is put off, and the looking to a centre or point of rest, together with what is linear, recedes ever farther away. Until at last nothing except what is perpetual, infinite, eternal, pure, holy, that is, divine remains. "It is evident (says the Philosopher) that that which is first of bodies is perpetual, and neither increases nor decreases, grows old nor is subject to alterations or passions (*De Coelo*, lib. I, cap. iii). "God first created the supreme world in which, without any thought, he set up forms all pure and perfect,—such, namely, as are procreated with their essence without affections. Afterwards he created this world*

that falls under our senses as an image of the former." (*De Sap. Div. sec. Aeg.*, lib. XIV, cap. vii.)

272. *We have striven towards these principles by the analytical way; from them, thus searched out, that is to say, from things first, let us now descend by the synthetic way to things postreme or lowest. For in order that we may arrive at principles which may be so many truths, it is necessary that we strive thither from things posterior, that is, from experience in the region of effects. But let us not make a leap to things supreme without paving the way by matters of experience, for then we may readily seize upon falsities as truths. To strive from things posterior to things prior is called the analytical way or method, while to descend from thing prior to things posterior is called the synthetic way or method. The analytical is to us, since the fall, the natural way; for we arrive at none of the sciences except by sensual experience which is made up of a totality of observed phenomena and modes; and therefore also we are long in acquiring wise judgment. The mind so depends on the experience of its senses that it hardly dares to reason unless it is supported by experimental proofs, and when these are lacking, it stands as it were impotent and knows not whither to turn. In the same order then it follows that from the Divine proceeds the spiritual, from the spiritual is created the celestial, from the celestial is produced and flows the vortical, from the vortical the spiral, from the spiral the circular, and from the circular the angular. Thus by a long series of succession and derivation, or by six degrees, there is produced from the most perfect that which, in itself and its own nature, is more or less imperfect, although in that sphere nothing more perfect than itself can exist. A thing is not in itself imperfect because it does not approach to the perfection of the prior; but in its own degree it can be most highly perfect. For example a brute animal or the soul of brutes may in itself be most highly perfect, although it does not approach to the perfection of man and his soul. In itself the circle is perfect, despite the fact that the spiral is more perfect than the circle,—for it is necessary that what follows in the order of derivation should be relatively imperfect. "In nature (says the Philosopher), the perfect precedes the imperfect; from*



which considerations it is clear that in the nature of things there is in a body some substance other than those constituents of bodies which we find around us, more divine than them all and prior to them." (*De Coelo*, lib. I, cap. ii.) "In nature are implanted the principles of generation." (*Sap. Div. sec. Aeg.*, lib. VII, cap. iii.) "[The *prima materia* exists by motion which is perfect action]. It is comprehended by the thought as being according to an infinite vicissitude of change from one form into another, nor does it obtain the place of a principle (or beginning) except only by the reception of form." (*Ibid*, lib. IV, cap. ii.) That nothing imperfect was created by God, nor can be created, is dictated by Sacred Scripture, and by sound reason; and this is true of man, of the solar system, and of our earth. *But that forms most perfect in their own degree become in themselves more or less imperfect, that is, are changed essentially.* I do not mean forms of the world which are void of life, but forms of the animal kingdom, that is, souls, and also angelic forms, all which are endowed with liberty of action. From the change of the more perfect state of these forms into one that is more imperfect flows also a change of the elements, nay, of the earth itself,—a truth which may be abundantly confirmed and which Sacred Scripture itself teaches. *This comes from causes without and below, and thus from causes within themselves, but not from causes above themselves. For if a form, in itself and its own nature more imperfect than a higher form and more perfect than a lower, seeks and yearns to become of the same quality as the superior form, or of the same quality as the inferior, then it necessarily undergoes essential change; and then the forms which have their descent and generation from it take on a similar and still greater imperfection according as they are distant from their origin.*

**273.** *In order that we may represent to ourselves an idea of the generation and derivation of such forms, or, of one from another, it is necessary that we hold to the idea of the existence of the superior forms within the several inferior, and at the same time to the idea of accidental changes; for the perfection of higher forms consists in the undergoing of acci-*

sential change has been explained above.\* [n. 241.] *Therefore when a number of superior forms unanimously associate together, and enter into, determine, and constitute one form which is then called a substance per se, there comes into existence a proximately lower form; and when these latter forms similarly associate together and enter into one form, there comes into existence a form still lower, and so on in order.* I speak of a number of forms associating together into one, just as though there were in superior forms plurality or quantity, and spatial relations, so that they can approach nearer, associate together, and be distinguished from others. But, seeing that form is an essential determination, and such determination cannot be conceived of without fluxion, nor fluxion without the idea of something that is determined,—whether it be a point, or a likeness of points, or anything whatever that is something,—therefore we cannot abstract the idea from a representation of plurality. Otherwise we should perceive nothing. In default of words in the higher spheres which shall correspond to words in the lower spheres, recurrence must be had to words of which we have some notion. Let us suppose then, that a particle of air is a kind of minute bladder, or, for the sake of a better understanding, let us take [a particle of] aqueous vapor. Suppose this to be distended by a small volume of air, and each particle of the air by a small volume of ether, and each particle of this by a small volume of higher ether; thus [the particle of aqueous vapor] by so many forms each in due order more simple than the other. It then follows that one form is generated from the other, and that the vapor or the aqueous bulla is the complex of them all, and that in it exist all forms from the first natural form to the last. Then, if the form of fluxion of the higher ether be vortical, it follows as a consequence that the fluxion of the ether within the bulla, is spiral, while that of the air is circular. But this will be better learned from a consideration of the fibres. *Wherefore when a compound form is dissolved it reverts to the prior form.* “All natural things (says Aristotle), have within themselves a certain order in which one depends on the other. In this order that which is posterior, when it perishes, reverts to that which is next

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\*The author here adds “in the present chapter.”



among things first, until it is brought back to the celestial orbs." (*Sap. Div. sec. Aeg.*, lib. XIII, cap. viii.) *Thus one form flows into the other, and that which is prior is always more internal, and that which is posterior always more external, and hence more remote. Thus the first form is toto coelo distant from the last, though inmosty residing in it. Hence it follows, that in the compound there is nothing substantial save that first and one which is called simple substance.* "In the compound ens (says Wolff), there is nothing substantial save simple entities." (*Ontologia*, p. 792.) "There are no substances save simple substances, and compound entities are aggregates of substances" (p. 793). *And that veriest form perpetually impressed, which resides therein.* "If there is force in a compound substance (says the same illustrious author), it must result from the forces of simple substances" (*Ont.*, 795). "Being, (says Plato), is distributed throughout the whole multitude of things, and from not one of all the things that are, either the smallest or the greatest, is it absent; moreover, in every single part of being is present the One (that is, simple substance, unity or the monad), which is absent from no part, whether small or large." (*Parmenides*, p. 144.) "Compounds (says Aristotle), are moved at the nod of the simple which is within them dominating and overruling." (*De Coelo*, lib. I, cap. ii.) "The first moving must necessarily move itself; which motion it undergoes according to nature; and the things which are moved, not being quiescent in their place by force, must necessarily establish that order which they now observe." (*Ibid*, lib. III, cap. ii.) "A simple body must of its own nature be fitted to be borne in a circular motion; that such a motion be the first motion is a necessity." (*Ibid*, lib. I, cap. ii.) *Such is the ingeneration and such the generation of forms or substances compounded from their simples. But that inferior forms may not fall asunder, but may subsist, and the superior flow into them, it is necessary that they be also distinct and that each one form and occupy its own sphere, to wit, the more perfect forms the superior sphere, and the more imperfect the inferior,—in such way, however, that superior forms shall ever be present in in-*

*ferior, and not the reverse.* "To God is given the highest and first seat of the world (says the Philosopher). That body most greatly feels his force and enjoys his divinity, which is situated next to him; then that which holds the second position, and each body thereafter according to the order of positions constituted by nature, all the way to our position." (*De Mundo*, c. vi.) *For which reason it is impossible that there be any vacuum.*

[273a] *From these considerations it now follows that posterior forms may undergo essential changes, while the prior forms still remain permanent in their integrity, except that these accidental changes enter within; and, by reason of the prior forms are as it were absent, although they are most fully present just as before, but not with the same power and force.* For if the generation be such as has been described it follows that the inmost forms may nevertheless remain permanent in the integrity of their essence even though the external determinations, or the determinations of the exteriors, be changed. Take, for instance, the aerial bulla or bladder spoken of above, which is of the circular form. If this should be changed into an elliptical form it would not prevent the interior bullæ from being able to retain the determinations of their own fluxion; for a change in the compound does not penetrate to those more simple forms so that they likewise are changed. They do not indeed then flow according to their whole nature; for in the ellipse they must regard two centres, and not one as in the circle. Therefore, by their accidental changes they accommodate themselves, to wit, that they may mutually regard each other through variations of expansion or contraction, and thus may associate together. This assuredly in no way changes their essence, although their force of operating according to all their potency is diminished. Thus, in the triangle, wherein are perpetual oppositions of determinations, they may be said to be deprived of their fluxion, but not therefore of their endeavor to action. *But to treat of these matters briefly is to treat of them obscurely; it suffices, however, for the intelligent.*" Let us now return to our fibre.

(*To be continued.*)



# THE NEW PHILOSOPHY.

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## Editorial Notes

A correspondent asks what work is meant by "Transactions" I and II so often referred to in the work on the Fibre (see nos. 269, 270 *et passim*). The question was answered in a foot-note to n. 59 of that work (see also, n. 75, note) where it was pointed out that "Transactions" referred to the volumes of the *ECONOMY OF THE ANIMAL KINGDOM*,—the first two Transactions being the published volumes of that work. Some account of the unpublished Transactions is given in the preface (p. 8) to the recent edition of *GENERATION*. The first two Transactions treat of the blood and of the motions of the brain; the third was to treat of the cerebrum; the fourth of the cerebellum; the fifth of the fibre; and the sixth and last of the soul. Transactions three, four and six were written out by the author in first draft; but the work on the Fibre, the proposed Transaction five, gives every appearance of having been prepared in final draft for the printer.

The same valued correspondent also calls our attention to an unfortunate error in the last issue of the *NEW PHILOSOPHY* arising from the dropping out of a line by the printer. As this issue was intended as a separate brochure on the Doctrine of Forms, our readers may care to insert the missing line in their copies. It should be inserted as the last line of p. 177, and reads: *dental changes*. What an accidental change is and what an es-

The third installment of Miss Beekman's *PHYSIOLOGICAL PAPERS* is devoted to a study of the doctrine of spheres as an

essential and principal part of the study of the nutrition of the human being. The doctrine is viewed in a universal light. Following the PRINCIPIA, Miss Beekman presents the infinitesimal sphere of a particle as the sphere of a great world; and in its activity she sees the universal operations of Divine Providence ever empowering for use and action.

The deeper and more vital nutrition of man is derived, not from the gross food-stuffs that present themselves to the sight, but from those clouds of infinitesimal particles which are given off by every created thing as the active sphere of its life. But these spheres are not sent forth into a lifeless field, to there sink into inactivity and death. The Living Divine, proceeding from the Lord as atmosphere or use, takes them up, buoys them, livens them and empowers, preserves their inmost form, and leads them to perform their part in the great Kingdom of Uses. It is this aspect of the subject that leads necessarily to the study of those great spheres whose manifestations are magnetism and electricity, and to the study of the laws of their empowerment and operation. A right view of these larger spheres is essential to a knowledge of those infinitely numerous spheres whereby the Divine operates continually to give nourishment and life to man. A knowledge of the visible is the reflexing ultimate to the intuition of the invisible; for the Divine is the same in greatest and least.

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We are indebted to Miss LILLIAN G. BEEKMAN for calling our attention to an error in the recent edition of GENERATION, and we are the more glad to draw notice to it, in that its correction involves the emphasizing of an important point. The error in question consists in the translation of *sidus* by the word *planet*, whereas its meaning as used by Swedenborg is *star*, i. e., a sun which is the centre of its own system. The passage is in GENERATION n. 298, and, as amended, should read:

298. *In the whole nature of the three kingdoms we meet with nothing more worthy of investigation, or more wonderful, than the formation and as it were creation e novo of man*



*in the womb. It is like the existence of a microcosm in the macrocosm, or like the sending forth of a new system, and as it were a new star from its ovum and its principles.* Every individual animal kingdom may not inaptly be compared to a world.\* For we are like stars careering in their great vortex or universe,—the latter being constituted by this society. The laws also of the universe are the same in both cases. Each orb is governed by as it were its own tutelary deity, and each has its own soul to rule that particular world. But this is a comparison, into the details of which we cannot fully enter.

It will be seen that the comparison is based on the teaching of the PRINCIPIA, that there is a universal aura proceeding from the Infinite; and that in this universal aura, and from it, are set up centres as the beginnings of suns, by means of which shall be created planets with their three kingdoms. So the human soul is as it were a new centre from which is to be created a new world with all its parts; and such worlds, or human beings, are to constitute the heavenly society of souls, that, is the Grand Man.

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PROPOSED REPRINT OF THE "ANIMAL KINGDOM."

The proposal made by DR. F. A. BOERICKE to reprint Swedenborg's ANIMAL KINGDOM provided there are 200 subscribers to the work, has met with but little response. The announcement of this proposal was not confined to the pages of the NEW PHILOSOPHY, for the NEW CHURCH MESSENGER, with a comparatively large circulation among readers of Swedenborg, gave it the most prominent editorial notice. Thus far, however, only nine subscriptions have been received. This would seem to indicate that there is little demand for the work, or, at any rate, that, for the most part, those who desire it already possess copies,—though how far this is true still

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\*By world (*mundus*) Swedenborg invariably means a solar system, *i. e.*, a sun with its planets, —the universe (*universus*) being

the term used to denote the created universe wherein the systems are contained.

remains to be seen. Suffice it to say that the purpose of the announcement is to ascertain whether there exists a sufficient individual *bona fide* demand for the work to justify the labor and expense involved in a reprint.

The subscriptions thus far received are:

Childs, W. C., Yonkers, N. Y.	Lechner, Hermann, Pittsburgh,
Dotter, Chas. T., Brooklyn,	Pa.
N. Y.	Mayer, F. S., Cambridge, Mass.
Grigsby, Anna C., Concordia,	Odhner, C. Th., Bryn Athyn,
Gill, W. Rey, Colchester, Eng.	Pa.
Kans.	Pendleton, Wm. F., Bryn
Hogan, Maria C., Bryn Athyn,	Athyn, Pa.
Pa.	

#### MEDICAL REVIEWS OF SWEDENBORG'S "GENERATION."

As being of interest to our readers, we subjoin a few extracts from medical periodicals indicating the nature of the reception given by the medical world to Swedenborg's recently published work on GENERATION.

The IOWA HOMŒOPATHIC JOURNAL observes, that "the work is one that it takes a person who is a scholar and possessed of a vast amount of special knowledge to review." The writer therefore very modestly refrains from attempting the task. But he assures his reader that the considerable time he *has* devoted to the work makes him "feel that the scholar will find it of great interest."

Not quite so modest is the reviewer of the BUFFALO MEDICAL AND SURGICAL JOURNAL. After referring to the work as a "classic," he writes: "While it is, of course, superceded by more modern scientific study, it is worth while to keep in touch with the early students, and those who do so will be properly humbled at the extent of knowledge obtained in advance of modern apparatus and collective researches."

To the JOURNAL OF AMERICAN HOMŒOPATHY the work is "one of exceptional usefulness and suggestiveness which seems to anticipate the future after a truly wonderful fashion. . . . Like all other treatises from the hand of this man of wonderful ability and acumen, anything like a 'review' presumes a



vast amount of special knowledge which few of us possess, and to digest any one of the many volumes put out by the great author means close and protracted study. Nor would it be a waste of time. . . . A fair-minded reader gets from Swedenborg an amount of culture which is not easily attainable elsewhere; for the man's mind was full of the most wonderful store of exact information on a large range of topics." But the reviewer evidently admires his author from a respectful distance, for he adds the lament, that to give Swedenborg his due by studying him day by day "is possible only for the fortunate few."

The review in the *ECLECTIC MEDICAL JOURNAL* is written by a New Church man, (the Rev. L. G. Hoeck), and is highly appreciative. Mr. Hoeck dwells on the "almost unanswerable arguments" whereby the author proves that the course of the spermatozoon is to the ovum direct, and apt, as now generally supposed, by way of the uterus. He further observes that the true value of the work on *GENERATION* will be appreciated only as the subject is approached with a realization of the truth expressed by its author at the very outset: "The propagation of the human race is the one and principal of all primary uses and ends, for thereby is raised up not only an earthly society, but also the heavenly society of souls."

The London *LANCET*, the most influential of medical journals, refers to the "Inductions" of the work as being "of extreme interest as giving an insight into Swedenborg's views of the continuity of the body and of the various vibrations which affect it. For Swedenborg had undoubtedly grasped a fact too often overlooked in the eighteenth century, namely, that the body is spiritual as well as material; and with all his strange visionary qualities, he possessed a great intellect." The reviewer concludes, "We hope that Mr. Acton's labors will lead his readers to consult some of Swedenborg's other scientific works in addition to the one before us, for by so doing they should obtain both pleasure and profit."

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"DIVINE WISDOM ACCORDING TO THE EGYPTIANS."

When writing for our last issue the article on "The Divine Wisdom according to the Egyptians,"—a work ascribed to

Aristotle,—we were unable to consult the first edition of that work, (Rome, 1519), having, as we thought, mislaid it. Since then, however, we have come across it safely ensconced among our own books, and we now find that a perusal of its preface or prefaces, (for it has three), makes necessary some correction and addition to our published article. The subject may have lost somewhat of interest to our readers, but historical accuracy would seem to require again bringing it forward. For the sake of brevity we shall present the facts as now seen without adverting in detail to our former article.

The work was discovered by FRANCIS ROSEUS, of Ravenna, during a journey entered upon at his own expense and with much discomfort, in search of ancient manuscripts. Visiting Damascus in the latter part of 1515 or the early part of 1516, accompanied by an Arabian interpreter, he visited the celebrated library of that city. Here he came across a "very ancient manuscript," entitled, in Arabic, "Aristotle's Theology or Mystic Philosophy," translated from the Greek into Arabic, by Abenama, a Saracen (Assyrian).

In his letter to Pope Leo the tenth, from which we gather the above facts, ROSEUS states that he was at once filled with the desire to possess this work, and he adds, "Therefore, having by the use of gold and by secret work obtained my desire, I returned, not without difficulty to Cyprus." Despairing of finding a competent Arabian Scholar in his own Italy, he engaged in Cyprus, a learned philosopher and medical doctor, MOSES ROVAS, to translate the work into Italian. Rovas' work was done "with haste, but faithfully,—each Arabic word being rendered by a corresponding Italian word."

On his arrival at Rome, ROSEUS submitted this translation to PETER NICHOLAUS, professor of Greek Philosophy, for examination, and NICHOLAUS, after highly praising it, undertook to translate it into Latin, "lest, clothed in a coarse barbarian garment," it be lost to the public.

In the second of the Prefaces, that by NICHOLAUS, the writer pays his respects to the Italian translation, (which does not appear to have been printed), describing it as "unordered by reason of the Arabian style, and unliterary by reason of the translator's ignorance." His own translation, (he adds), is made in "a purer Latin" than that used by philosophers, though he has "avoided any elegance of style lest it be said that it is not a philosopher speaking but a piper playing." Moreover, examination having led him to the conclusion that the Arabian translation was more of a paraphrase than a translation, he did not hesitate in his translation to "boldly express the meaning rather than the words."

NICHOLAUS appears also to have supplied the chapter headings, for



it is stated that he reduced the work "into most exact order according to chapters." His translation was published by Mazzochius in Rome, 1519, and in a note at the end of the volume, BERNARD DE HUIDOCTIS states that the final touch was given to the work by Lucas Hauricus; but, (continues Bernard, with an earnestness not unknown to the modern editor), whatsoever errors Hauricus could not remove, I denounce as being due to the rustic printer."

For the edition of 1519, ROSEUS secured from the Pope an exclusive copyright for ten years under pain of excommunication. But apparently there was little need of this, for the work was not again printed until a hundred years later, when it was included in DuVAL's edition of Aristotle's *Opera Omnia*, Paris, 1619. Here it is announced as "translated from the Arabic into Latin by Jacob Carpenter" an English Doctor of Medicine and professor of philosophy resident in France. This, however, is a manifest exuberance. For, as Nicholaus complained of Rovas, so now Carpenter complains of Nicholaus, whose translation was so done "that, though we owe great thanks to his labors . . . yet it cannot be denied that nothing can be more stupid than his interpretation." Carpenter, therefore, labored "that the Latin may be a little more tolerable, with a more accurate distinction between the formerly confused sentences." He also asks the reader to judge his work by comparison "with the copy we have followed." In this revision Carpenter supplies new chapter headings, entirely discarding those of Nicholaus.

Carpenter's "Address to the Reader, was written in 1571, from which it would appear that an edition of the work was issued at that date; but we have no record of any such edition.

To what we have already stated as to the authorship of this work, it remains only to add that DuVAL strenuously refutes the opinion unhesitatingly accepted by Nicholaus and favorably regarded by Carpenter, namely, that it is by Aristotle. He believes, on the contrary, that these fourteen books "were put forth by a Platonist, either Greek or Arabian." DuVAL's reasoning is very close, not to say convincing, so that we are led to considerable doubt as to the matter,—a doubt which may be resolved by a study of the Arabian manuscript. It would seem also that the most probable reading of Swedenborg's remark on the subject, is "I do not believe it is Aristotle's because it is too sublime."

While on this subject, we take occasion to note a point of interest relating to a chapter heading of the work which we quoted in our last issue, p. 149, namely, "How man, contained in the sensible world, is to be prepared and excited to the contemplation of the intelligible man, (? world)." We suggested that the word "man" was a possible mistranslation for "world;" but at that time it was not clear to us whether the

headings were by the author or by the translator. This is now clear. But we again call attention to the matter because a careful reading of the chapter in question brings out an interesting and theologically important point, namely, that the author of the work regards the intelligible world as one with the Intelligible Man, or God. We add a translation of the whole chapter, using the interpretation made by Nicholas as being nearest to the original.

"OF WHAT QUALITY IT BEHOVES LOWLY MAN TO BE THAT HE MAY REGARD  
THE SUPREME MAN."

"When a man would regard the primary and true Man himself, it behoves him to be distinguished with great unrightness and with dignity, and also to have powerful senses, lest they be darkened when the bright rays from the supreme Man rise upon them. For verily the primary and true Man is clear light, and therein exist all distinguishing human reasons. And this is that man whom Plato defined, except that he added to the written definition, by saying that man is a rational animal, that is, a rational life or soul which is served by its own body. For the body does indeed serve this soul in the first place, but the divine noble soul in the second, and this by means of the sensual soul which the rational soul accompanies, bestowing upon it a more potent life; and this, not by descending from the supreme world to the lowest, but by inflowing. For the rational soul does not lapse from that intellectual world into this, but it is conjoined to that soul which depends on it. Wherefore also, the reason of this man, although it be imperfect, yet, sublimed by origin from that exalted reason and by union with the same, it will become stronger. For this cause some have said that the particular mind is a part of the Universal Mind."

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## PHYSIOLOGICAL PAPERS.

BY LILLIAN BEEKMAN.

THE FACTS OF NUTRITION RELATIVELY TO THE BLOOD, AND  
THE ORIGIN, NATURE, AND LAWS OF THE VOLATILE  
SPHERES OR RADIO-EMANATIONS TO WHICH THE  
MAJOR PART OF NUTRITION IS DUE.  
MAGNETISM. ELECTRICITY.

The existence of the red blood and the white blood require a concurrence of all things stored in the earth's domain or given off from the earth into the atmosphere. It requires:

1. The terrestrial chyle expressed from the food of the stom-



ach. 2. The chyle dissolved in the air or floating in its current, which is imbibed by the veins in the lungs. 3. All the subtlest connectives and effluvial spheres dissolved in or floating in the ether.

It is a prime requisite that the nutriment of all these planes or degrees shall be provided in a liquid form.

We will take up first the terrestrial chyle expressed from the food of the stomach.

#### THE TERRESTRIAL CHYLE.

The tongue, mouth, pharynx, œsophagus, stomach, intestines, pancreas, liver and spleen are all concerned in preparing this food and introducing it into the blood. While the food is still in the œsophagus or intestines, it is not yet in the body and blood. To illustrate: Little animalcula in the water—which find their food floating in minute particles in the water itself,—are shaped, some in the likeness of a hollow pear or of a hollow tube or globe; some with an opening at each end; and some with an opening at one end only. By a certain animatory expansion they draw in the water with its floating food particles, whether these be organic remains, or smaller creatures, or salts floating in its current. The cells then sip out from that liquid the food particles which they wish; and the remaining liquid is expelled by a contraction of the body. One can see that, although the current of dissolved food is directed through their bodies, the food in that current does not become a part of the body until the cells have sipped it out and it has entered the confines of the organism. So it is in regard to the food in any part of the alimentary canal before the cells lining that canal have sipped it out, as it were, and transferred it to the lacteals or to the veins.

Now in order to make it possible for food substances to be imbibed or sipped out by the cells of the organism, it is necessary that those substances be divided to an almost infinitesimal fineness. For instance: Before the food in the stomach and intestines can be absorbed by those organs, the salts which are in the food must be dissolved in water.

Let us examine what it means for a salt to be dissolved. The crystalline structure of the salt is built up of geometrical

particles of two types: (a) The round particles of the water molecules which constitute the water of crystals; and (b) the salt particles proper. These latter are block forms; solid; either cubic or triangular; and of a dimension able to fit into the interstices of the round water particles. When a fragment of salt is dissolved in a current of water, these small finer blocks become separated from each other and enter into the interstices of the water molecules of the general stream. The angular or connective particles of the salt slip into and fill the interstices between the round water molecules, and displace the ether which formerly filled those interstices. Therefore a considerable amount of salt can be dissolved in water without adding to its bulk. For the solid particles of the salt actually occupy the interstices between the molecules of water; and therefore they, as it were, do not take up any more space.

The food matters of other types,—oils, starches, albuminoids,—can enter the body only when the little masses of their molecules are so finely divided that the stream of the water floats them along. As an illustration, take a log of wood. This would sink to the bottom of a stream and could not be borne along with it; but if the log be reduced to particles fine as sawdust, it would then be easily carried in the current. So may we regard the food when it goes into the stomach. Its masses are equivalent to the bulky log of wood, and the primary processes by which the food is prepared for assimilation are for the sake of reducing it to, as it were, its “sawdust particles.”

As a matter of fact, we have strict limits of size within which absorption can take place. When the food masses are divided until they are in particles no more than one five thousandth of an inch, those particles begin to dance in a little circling or oscillatory dance. When they are still more divided, their movement is faster, and the circle of oscillation of less diameter. When they are divided more finely still, the movement can scarcely be traced.

Now no food can be absorbed or as it were sipped out from the stream of the dissolving chyle by the mouths of the cells,



until it has been reduced to particles of at least that dimension where the dancing movement begins. This is the oscillation or dance which is called the Brownian movement. All particles of matter whatsoever, which are of like fineness, exhibit this perpetual oscillatory motion.

When the food particles are reduced to this fineness, or approximately so, the cells are able to sip them in. And in the cells themselves, by the fine tremulations of their vital activity, the division of the particles is made finer and finer; and they form what is called the molecular basis in which the dance, the oscillatory motion is marked. Then the particles become smaller and smaller even to the limit of microscopical invisibility, and, as they pass over the limits of visibility, their dance is faster and faster. The purer blood is catching the dancing particles and swinging them into their place to add ever one particle more to the vital organic form.

The ground of this dancing activity is because these particles also are framed from the primitives of the Spiritual Sun. For the primitives of the Spiritual Sun are the one only Substance from which all compounds are made; and these primitives, which are the very simples and seeds of creation,—finited by the Infinite Father to be given as materia for the formation of the objects of the created universe,—are not passive particles, but are least points of the Infinite Substance in a circling or vortexing conatus. Since, then, that endeavor to a circling motion is inherent in the very existence of those primitives, it follows that compounds framed of them,—even to the very matters of the earth of food and water,—have an intrinsic effort toward motion, and toward motion in a circle or vortex. When the compounds are large masses, this effort is concealed. To illustrate: Suppose an army of men, each individual of which is in the endeavor to run in a small circumscribed orbit at a given speed. But the army is so large, and is compactly held together in so narrow a space, that although each man be in this effort toward onward circling motion, he is, as it were, opposed by the efforts, of other men whose circles run counter to his. Thus although there is a certain struggle and unrest everywhere throughout this hem-

med in army, the army itself as a whole will remain motionless. Now suppose you divide this army of men into small groups, and bring them into circumstances permitting greater freedom of motion, then it is possible from the united endeavor of all the men composing the group, that a certain shifting or motion in the group, as a whole, should be able to actualize itself. If you again divide these companies into groups, say, of ten men bound together, still the body cannot move as freely as the single man, nor as fast. But the consensus of the common endeavor of all will give to the mass a certain movement approaching or imitating that which is the *conatus* or wish of the individuals.

To go over this point again. In order that food taken in may become assimilable, that is, may become such that the cells of the stomach and intestines can, as it were, draw it in, it is necessary, First: That the salts of the food be dissolved in liquid; and, Second, That its fats, starches and albuminoids be reduced to particles of such infinitesimal dimensions that the Brownian movement commences. When the cells have, as it were swallowed or imbibed these particles, then the division is carried still further. The Brownian movements or oscillations become faster, and the particles themselves approach the limits of microscopic invisibility in faster and faster dance until they pass completely out of sight.

This process is comparable to the choral dances which are part of the preparation of spirits in the other world, for entrance, as it were, into the tides of the blood of the Grand Man,—the great streams of the Lord's Providence which are to bear them to their own place in the organic heaven. Indeed the two things here are correspondents; for, in like manner as spirits must be introduced into swifter and swifter gyres before they are, as it were, assimilable, and pass into the stream of Providence bearing each to its permanent place in the body of the Grand Man as organic part thereof, so also is it in this story of the preparation of the gross food stuffs for their entrance into the organic body of the individual man.

So much for the terrestrial chyle or nutriment for the organic form.



## THE AERIAL CHYLE.

There is another and finer chyle which is, as it were, dissolved in the flowing atmosphere, that is, in the stream of the aerial elementary circumfluent around the surface of the earth. This chyle is received, not into the large general stomach of the body, but into the multitudinous stomach of the lungs, that is, into the myriad little living dining-halls, built of cells, called the aerial vesicles,—the lungs.

In general, two things are carried in this stream of aerial chyle: (a) A volatile salt dissolved in the interstices of the spherical units of the aerial elementary, as common salt is dissolved in the interstices of the water particles; and (b) Oils and particles given off by the various bodies of the vegetable kingdom, as well as the radio-emanations of much of the mineral kingdom,—these being comparable to the more finely divided food masses in Brownian movement carried in the liquid stream of the chyle of the stomach.

To gain some idea of the importance of this food of the aerial plane,—this atmospheric chyle of its two types,—it is to be remembered that the blood must be refected by it about eighteen times per minute; and that if it ceases to be so refected for fifteen minutes the creature dies. In considering the lungs as a compound stomach, it is to be recalled that each one of its air vesicles is a little stomach lined with little imbibing cells which first sip from the air the aerial chyle, and then hand it over to the veins. Now if the lining membrane of all these vesicles, these least stomachs, should be spread out as it were into a single carpet, the size for an adult human lung would range from a minimum of four hundred square feet to a maximum of sixteen hundred. Moreover these minimal stomachs or air vesicles, these least dining-halls for the aerial chyle, are in number about half as many as the inhabitants of the globe,—some 600,000,000. That here is provided a great, a subtle, an absolutely important nutrition of the living economy, can be seen from these figures where by very ideas of number and space our thought becomes enlarged to thoughts and comprehensions almost beyond the limitations of number and space.

Now, as already noted, there are two distinct things that are taken into the lungs in this aerial chyle, namely, (a) Certain triangular salts or inert particles, now termed the atmospheric gas, oxygen; and (b), Volatile vegetable oils and essences (called odors), and all radio-emanations of a grosser type.

(a) *The great mass of that food which is thus taken in, consists of certain triangular salts or inert particles literally occupying or dissolved in, infilling, the interstices of the aerial elementary*, even as ordinary salts are dissolved in the stream of water in the terrestrial chyle. This "aerial salt" is what we now term the atmospheric gas oxygen. Swedenborg says it is the highest member of the sulphur family;—as is indeed literally true, according to the periodic system of chemical elements. Yet, at the time Swedenborg wrote, oxygen was not known, nor had the periodic relations of the chemical elements been discovered:

"The lungs thoroughly examine the air attracted by inspiration, and alternately a welcome guest; and should it have brought any rich or choice presents in its vaporiferous bosom [*i. e.*, between the bullæ of the aerial elementary or air],—any members of the volatile families of salts, sulphurs, and nitres,—the lungs suck them in delightedly by their veins; although as soon as ever they have enjoyed the banquet, they throw out the air as the most deadly enemy of the blood. . . .

"The air is to the highest degree elastic, expansile, compressible; it is tumid when exposed to heat, compressed and collapsed when exposed to cold, . . . and its particles are larger and lighter than those of water. The blood, on the other hand, although possessed of some elasticity, does not permit of expansion and compression. . . . Were the air to get into the little ramifications of the arteries through the larger branches, it would completely block up their mouths and preclude the entrance of the blood, and, congregating in dense vapors, enormously distend the little canals, as we know it distends the intestines. . . . Hence it is driven out to prevent it from penetrating too far. . . . Nevertheless, for the sake of the gifts and presents that it brings, it is a welcome guest; for it carries in its bosom, as companions of its winged career, the first elements of salts and sulphurs, and proffers them liberally to the universal mass of the blood." (2 A. K. 406, and note d.)

Moreover, the change of venous blood into arterial, which takes place in the lungs, is, Swedenborg says, due to this volatile aerial salt:



"The atmosphere, impregnated with effluvia exhaled abundantly from the three kingdoms of nature, and filled with odors, is attracted in volumes by the spiracles of the nares. . . . Closely examined at every corner of the way and emulged of its impure accompaniments, it at length comes to the lungs in their smallest form, namely, to the vesicles, and, now warm and bathed in vapors, it has nothing in its bosom but what is friendly to the blood,—nothing but delicate and welcome presents which the veins, omnipresent in their little atmospheric world of the vesicle and hungry after all their losses, most eagerly seek out, select and imbibe. Thus the blood, fed and feasted with occult, and ethereal, and heavenly food, and no longer turbid and cloudy, but serene, florid, purple, joyous, lively, and worthy of marriage with the spirit, has already put on the arterial robe." (2 A. K. 406.)

"When the sanguinous chaos . . . has been driven through the filters of the lungs, purged of its discordant parts . . . ; when, furthermore, it has been saluted with atmospheric kisses, enriched with occult celestial aliment, and raised thereby to a higher power of radiance,—then the portion of it that flows into the veins and passes into the left chamber of the heart is arterial; and its serum is so virgin and marriageable, that wherever it finds the spirit unmarried or single, and comes into relation with it, there it forms a speedy alliance, the issue of which is a ruddy, flaming and refulgent blood,—a parent so prolific that the universal body is its offspring. . . .

"The venous blood . . . as soon as it is separated from incongruous and heterogeneous matters, and impregnated or tintured with ethereal aliments, then it assumes an arterial character." (2 A. K. 407, and note r.)

Swedenborg also teaches that this invisible aerial food, the triangular atmospheric salt is exhaled into the air by the vegetable kingdom. That, as a matter of fact, the superabundance of this salt which the plant imbibes from the earth,—that which is over and above what it needs for its own purposes of building,—is carried along in the current from the root to the leaves or "summit," and is there exhaled with the watery vapor into the general volume of the aerial elementary to contribute its quota to the nutriment which the lungs supply to the blood. (*Corpuscular Philosophy*, 7-8.) See also, on the whole subject of the feeding of the blood by the aerial chyle. (2 A. K. 406, 407, 509, together with the notes.)

(b) *In addition to this salt, Oxygen, the aerial chyle also carries in its stream all those volatile vegetable oils and es-*

*sences which we are in the habit of styling Odors; as well as all radio-emanations of a grosser type.* A large part of the nutriment as well as of the stimulus of the finer planes of the organic body is, (Swedenborg says), derived literally from this source. Nor are the substantial powers, the forces, the effects of that which is literally infinitesimal as to size, which cannot be weighed, which cannot be estimated by chemistry, absolutely unknown to modern physics. Who, for instance, has weighed the perfume of the rose? Who has estimated the power of the fragrance of spikenard? It is impossible to gather up enough of the outpouring odors of herbs or flowers, even for the purposes of spectrum analysis? Yet the powers of these infinitesimal nothings of substance have registered their potencies in unmistakable effect.

Dry air,—air as dry as can well be prepared,—absorbs practically nothing of the heat that passes through it. For instance, if you have a stove radiating heat at one end of a tube of air,—which air has been dried as much as possible,—and some cold body at the other end of the tube, the heat received from the stove would pass through that dry air without perceptibly raising its temperature; and yet the cold body at the other end of the tube would become warm! That body would appropriate, as it were, all the warmth that the air had simply passed along without appropriation. Now let a merest drift of perfume be added to the dry air in the tube—a drift of perfume that cannot be measured; not the perfume-giving substance, but that infinitesimal emanation which we call the odor of such substance. The merest trace of the perfume of sandalwood introduced into the air in the tube would cause that air to appropriate of the heat that entered it, thirty-five times as much as it would appropriate without the perfume. The merest touch of the perfume of cassia will cause the air in the tube into which it is introduced to appropriate to itself one hundred and nine times as much heat as the air would appropriate of its own power without the perfume. And if it be the perfume of spikenard,—very precious, such as filled the house when the ointment was poured out on our Lord's feet,—an infinitesimal trace of this perfume in the air of the tube,



will cause it to appropriate three hundred and fifty times as much heat as the air alone would be able to appropriate.

Here then we have effects of the utmost positiveness,—effects coming from particles of substance too small for chemistry to estimate them; particles which spectrum analysis does not know; which physics cannot weigh, even in the delicate scale of a beam of light. These volatile oils of the vegetable kingdom, these odors, these radio-emanations of the finest type, small enough and light enough to float in the aerial, or even in the etherial current, are,—Swedenborg says,—that fine nutriment which must be continually drawn into the blood by the lungs, together with the salt, oxygen, in order that the blood may be prepared, and be kept in vital power.\*

“There is not a single object in the mineral kingdom which does not give out an odor, and indeed in the form of an impalpable powder by which seeds are impregnated. In the vegetable kingdom also there is not a single object which does not emit an odor. This odor consists of particles of a fatty and saline nature which are given out at the same time with the watery exhalations. In the animal kingdom also there is not a single object which does not breathe out an odor.

“Odor or scent is nothing else than a sort of smoke consisting of minutest substances separated from the various matters. This separation goes on continually and the loss is made up by the addition of new particles. The particles which are thus cast off become the volatile aura [sphere] of their subject. This appears clearly from the magnet, and from dogs used in hunting which pursue hares, stags, and game of different kinds by their smell. (Additions to *True Christian Religion*, in 3 Doc. 769.)

The CORPUSCULAR PHILOSOPHY, in its paragraph on the uses of vegetation, treats likewise of the distinction between the “creeping salts” carried by the transpiration current running through plants, and the essential oils and spirits of vegetation separated as particles from their very substance,—both of them, however, being given off and dissolved or floating in the air and the ether as a finer chyle or nutriment for the animate body.

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\*An instance perhaps worth adding is the fact that fish are not able to live long in distilled water, that is, in water from which all organic particles and odors have

been removed, even though that water have abundance of oxygen, and even though the fish have abundance of such tangible foods as we can see.

It is to be noted in regard to these odors, that they are for the most part the essential oils and spirits of the vegetable kingdom, and that the typical form or pattern of a unit of oil is a small spherical volume of ether enveloped or crusted over with the scale-like particles which are the primitives of carbon, that is, with ramental sickle-shaped keen edges broken off from the angles of the perfect primal salt of the sea. The spherical particles which constitute the infinitesimal odors which are the essential oils of the vegetable kingdom are thus light and winged indeed; almost as foam-like and bullular and floating as the auras themselves.

In every man the blood of the heart is alike nourished, (1), by volatile elements; and (2), by odors from the air; and yet in a wholly different way in the good and in the evil.

"Every man actually consists only of such things as are in the earth and from the earth in the atmospheres. Those things which are in the atmospheres from the earth man sucks in through the lungs and through the pores of the whole body,—and the grosser things by means of foods made up of earthy particles." (T. C. R. 470.)

"That the blood nourishes itself with such things as are suitable to it from the inhaled air is evident from the immense abundance of odors and exhalations continually flowing forth from fields, gardens and woods; and from the immense abundance of salts of various kinds together with water, from lands, streams, and ponds; and from the immense abundance of exhalations and effluvia from men and animals whereby the air is impregnated. That these flow into the lungs together with the inhaled air cannot be denied; and since this cannot be denied, neither can it be denied that the blood attracts therefrom such things as are suitable to it; and such things are suitable to it as correspond to the affections of its love. . . . That the blood in the lungs purifies and nourishes itself correspondently to the affections of the animus, is not as yet known, but it is well known in the spiritual world. For the angels who are in the heavens are delighted solely with odors which correspond to the love of their wisdom, while spirits in hell are delighted solely with odors which correspond to the opposite love of wisdom. The latter odors are stench, while the former odors are fragrances. That men in the world impregnate their blood with similar things according to correspondences with the affections of their love follows therefrom. For what the spirit of man loves, this the blood, according to correspondence, appetises and by the respiration attracts." (D. L. W. 420.)

"The blood with men in the world is nourished by means of the air with similar substances as being homogeneous, and is purged of dis-



similar substances as being heterogeneous. The human blood in inmosts is spiritual and in outmosts is corporeal. Wherefore they who are spiritual nourish it from such things in nature as correspond to things spiritual, but they who are merely natural nourish it from such things in nature as correspond to them. Hence the dissimilitude of the bloods in men is as great and is such in quality as is the dissimilitude of loves, for the blood corresponds to the love." (D. Wis., X. 6.)

By the effluvia from the earth and from the exhalation of vapors from vegetables, by which the atmospheres are impregnated, the blood is nourished. Moreover, from these, insects and animalcules are procreated. (D. L. W. 62, 65, 342.) For, as the ADVERSARIA teaches, in the air and ether are floods of those finest material primitives and beginnings; and from them the simplest primitive forms of organic life and action are continually being produced.

"In the air and in the ether there are floods of particles which straightway serve for composing those things which regard ulterior texture. There, are the perpetual material beginnings from which all composition is possible." (1 Ad. 1457.)

Moreover, by them God can, at will, and often has clothed angelic essences with flesh and blood able to act upon the plane of effect; as was the case with the angel who wrestled with Jacob, (*Ibid*).

This emanation of odors or effluvia consisting of particles of like nature as those of which the mass of the substance or body is composed, is a property not only of the subjects of the vegetable kingdom, but also of the mineral and of the animal.

"Unless all created things, both animate and inanimate, possessed some kind of free determination there could be no creation. . . . Unless again there were something analogous to free determination in the soil of the earth, in the seed sown therein, and in all the parts of the tree thence produced, and in its fruits, and again in new seeds, there could be no vegetable of any kind. If there were not something analogous to free determination in every metal and in every stone, whether precious or common, there would be neither metal nor stone, nay, not even the smallest grain of sand; for this freely absorbs the ether [etherial particles] and breathes forth its native essences, and casts off what is obsolete, and renews itself with fresh substances. Hence comes the magnetic sphere around the magnet, the iron sphere around

iron, the coppery around copper, the silver around silver, the golden around gold, the stony around stone, the nitrous around nitre, the sulphureous around sulphur, and a varied sphere around every particle of the dust of the earth, from which sphere the inmost of every seed is impregnated and what is prolific vegetates; for without such an exhalation from each little particle of the dust of the earth there would be no beginning of germinations and thence no perpetuation thereof." (T. C. R. 499. See also, D. L. W. 293; 3 Doc. 769.)

Here the statement of radio-emanation and its use is absolutely definite. Within a decade instances illustrative of this have come to hand in the scientific world. For instance, it is now known that masses of metals are surrounded each by a molecular sphere of the same that is within it. Indeed if a plate of gold and a plate of lead have their surfaces freshly planed or smoothed and be closely bound together, then, after a space of time the radio-emanation of particles going out from the mass of gold will have interpenetrated the mass of lead to an appreciable distance, so that a film of gold alloy will be formed upon the plate of lead; nor will the original plate of gold have lost in weight, so far as we are able to ascertain. In the case of the radio-emanation of the new-found metal radium, the bombardment of the particles going out from the metallic mass is of such momentum, such swiftness, that their blow and impact sets the bullæ of the surrounding ether into the undulatory vibration of light, so that the parent mass of the radium is surrounded with a sparkling, glowing radiation of light.

In other provinces also this outgoing tide of effluvial emanations has been unmistakeably registered by its effect. A radio-emanation going out from the substances and matters of the vegetable kingdom is such that slices of wood one hundred years old can, by the impact of that emanation,—still continued from its molecular leasts,—so affect a sensitive photographic plate that the image of the rings of the original growth will be produced in that plate. Moreover, what is most interesting, we have the fact that that part of the ring which was grown in the Spring, and that part which was grown in the Fall, produce distinctly different effects upon the plate; the part of the ring grown in the Springtime when



the heat was greater, giving off, even a hundred years afterwards, a far more full and active radiation than that part which was grown in the Fall.

Tinctures and essences derived from the vegetable kingdom, are also rich in such radio-emanant powers; their selective action upon living organic bodies seeming to be the function of their emanation rather than of their mass. Moreover, something of the like radiation is known to exist around organs of the living body when they are in functional activity; the radiation being greater as the functional activity is heightened, lessening with its lessening, and ceasing when it dies. In regard to the functional areas of the brain, this changing radio-emanation has been happily measured and registered on a photographic plate.

Let us return now to Swedenborg's great fundamental statement, and learn, if we may, somewhat of the living interior causes of these things. In the quotations, both from the DOCUMENTS and from the TRUE CHRISTIAN RELIGION, the magnet is given as a common type of this radio-emanation and its conditions and powers; to this then we may refer with confidence.

#### MAGNETISM.

In Swedenborg's PRINCIPIA the real conditions of the magnetic force are unfolded, and the relative part in the production of that force played by (a) the activities of aura-flow, and (b) the molecular or radio-emanant spheres existing about the mass of the magnetic metal. For in magnetism as an effectual force both these factors are involved.

It will be recalled that for the production of the middle and lower bloods two things are requisite,—a father force and a mother substance; or, a father formative, primarily of the human or first aura, and an infilling of spheres and substances given off by mother earth and her lower kingdoms or forms. The blood formed is as it were the offspring of the two, involving both factors actually in itself.

Now in his presentation of the subject of magnetism, Swedenborg says that corpuscles,—whether as parts of the mass of metal or as the corpuscles or effluvia given off and

floating as a volatile sphere about that mass,—whatever their form, are magnetic, provided the little foramina, pores, and as it were interior vessels and sinuses in the texture of their inner molecular structure are such that the bullæ of the second aura can pass through them in a stream, and yet are so narrow, or of such fine caliber, that the bullæ of the third or grosser ether are, excluded. (2 *Principia*, I, § 10.) Just as through the canal of the nervous fibre the animal spirit can flow, although from canaliculi of such smallness the red blood is forever excluded.

Moreover, these foramina or pores are such that the inner structure of the floating effluvial particles must be either straight or but slightly curved. (*Ibid*, § 10, 11.)

These intra-molecular foramina and sinuses which penetrate the molecules in emulation of the veins and arteries of the circulatory system were formed by the auras when the molecules as integral entities were being constructed. For the subtle elementaries or auras, says Swedenborg, create a channel for themselves in the very texture of the molecules of hard bodies when those molecules are being formed; and in those channels the elementaries are as it were in continual flow and reflow. (*Ibid*, § 10, 15, 16.) Even as blood is in flow and reflow and circulation in the vessels it has formed. The auras thus act as the “formative substance” of the forms of the mineral kingdom, as well as of those of the other kingdoms. Hence it is said that all the objects of the mineral kingdom also have as it were a soul. (*D. L. W.* 310, 313.)

The intra-molecular constitution of inorganic bodies is therefore full of fine channels,—invisible, wonderful—through which flow continual currents of the auras or ethers in a kind of perpetual circulation, which preserves, conserves, and as it were nourishes them, and redintegrates the loss caused by emanation,—even as the bloods flowing in organic living bodies preserve, conserve, and nourish them, and redintrate the losses caused by their normal outgo in radio-emanation and work.

In the case of magnetic corpuscles given off from a metallic mass and floating as a sort of sphere or smoke about that mass, a minute vortex or circulation of the magnetic elementary (the second ether or aura), is set up, which runs con-



tinually through the pores of the effluvial particles, and, circling around outside in the general volume of the second aura, returns to flow in again at the little poles of the particles,—so that a little vortex is set up in the surrounding aura. (*Ibid*, § 18.) Thus the canals or foramina running through the particles bear some such relation to the circulations of their aura-vortex, as does the tubular heart of insects to the vortex-circulations of their animate fluid.\*

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\*This illustration is the closer, because there actually exists throughout all these effluvial particles a subtle expansion and contraction which produces results comparable to the contraction and expansion of the tubular heart of insects. This expansion and contraction in the molecular or effluvial particles arises from the fact that no form whatever, even the minutest, is ever contextured of inert or solid particles alone. Always there are bullæ of some one of the atmospheres;—bullæ, or elastic spherical forms, which are built in, as it were, in the solid substance, and form a large percentage of the bulk of its constitution, the inert particles being packed around them, and arranged in various relations. And, remembering that the bullæ of all the auras or ethers, wherever they are, are kept in an animatory motion of alternate expansion and contraction by the Sun of Life,—either immediately, or through the instrumentality of the natural sun (*T. C. R.* 30, *S. D.* 1847),—it follows that these bullæ, even though they be bound, cribbed, hemmed in, cabined and confined about by the concave-sided, inert block-form particles, (salts and fragments), are still in the en-

deavor towards a rythmic expansile motion;—a motion which, as regards the bullæ of the special ether that are bound in with the texture of the given molecule, will be synchronous for all. Now when the elastic bullæ built into a molecule are all expanding individually, a slight expansion will be given also to the whole substantial structure of the molecule; and this expansion of the solidly built portions of the molecular structure will produce a slight contraction and constriction of its pores, sinuses or vessels, and *vice versa*. The alternate expansion and constriction thus produced is emulous of the expansion and constriction of the tubular hearts of insects; and is sufficient to maintain a perpetual circulation of the ether through and around the effluvial particles of the sphere.

From this illustration can be seen also the necessity of the rule given by Swedenborg, namely, that the foramina, pores, or ducts in the interior molecular structure must be either straight or slightly curving. For if they were set at right angles and as it were across each other's path no even circulation through them would be possible. (2 *Prin.* I, § 15, 16.)

Moreover, since the aura within the pores or channels of the texture of the effluvial particles always makes one with the volume without, this circling wheel of the vortex takes up, buoys up, the effluvial particle, and turns it round continually with the turn of its own rotating gyre;—even as the whirl of the ether volume about the earth carries the earth around perpetually in the arms of its own rotation. (2 *Prin.* I, § 11, *T. C. R.* 30.)

With regard to the sphere-particles themselves, we read in the SPIRITUAL DIARY:

“That spheres of activity surround men, may be inferred from a multitude of things, nay, even from natural things, which are encompassed by spheres and which, without them, could neither exist nor subsist. And it is remarkable that the learned have not made reflection upon spheres, when yet they are of such nature that in many subjects they manifestly reveal themselves, and, in fact, in the several subjects of the threefold kingdom [of the world]. Nay, there is not the smallest particle which has not its sphere around it; and conformant parts constitute a common sphere conformant to the parts. . . . The Lord’s Sphere, because it is Good itself and Truth itself, extends into the universe, embracing, cherishing, vivifying, and thus ordaining all and single things.” (*S. D.* 1846, 1847.)

All such effluvial parts or corpuscles have each a spiral vortex formed through and around them at the same time. In each vortex a minute particle of effluvia is the centre,—like as the earth is the centre of the whirling vortex by which it is continually turned about. The vortex and the revolving effluvial particle thus constitute one motion and combine as one effective force, the vortex depending on the existence of the effluvial particle for its own first existence or creation, and the effluvial particle being without wings or power save as the vortex-flow in and about it makes with it, as it were, one cause and one instrument.

Thus a passive form, or a particle, by virtue of the channels running through it, is able to emulate the office of an active centre, and to set up a circulation in the volume of aura around it; the vortex-flow of the aura gives it all its active power; and the two are thereafter inseparable, and make, as it were, one cause and act one force.



According as is the number of the particles thus given off to constitute the sphere, such is the number of the vortices that are formed, and of the forces of the sphere,—some magnetic masses possessing abundance, and some a sphere that is scanty and weak. Moreover, these vortices become arranged pole to pole. And since they are of a vortex-ring shape, close can be their colligation, and not easily broken. Where lines of vortices are formed, there, in the invisible and apparently empty air around, will be found lines of actual physical force;—lines strong in the direction of the common trend and pressure of the advancing stream of colligated vortices, and weaker or naught when the common trend or harmonious choral motion of their line is weaker or naught.

The magnetic needle is moved by the larger magnetic stream of the earth, which lays hold of the sphere of intangible vortices and turns them. But to turn them, that is, to turn the sphere, is to turn the needle or the mass which is parent to the sphere; for the emanation-sphere and the parent mass make one cause. (*2 Prin.* XV, § 2, 8.)

Thus, while mechanical force is the action of tangible masses, and of mass on mass, and is a force relatively limited and measurable, magnetic force is an action of spheres, and of sphere on sphere, and is a force relatively unlimited and immeasurable.

The distinction made in the *PRINCIPIA* between the conditions underlying the electric force and those which underlie the magnetic, brings out one of the great laws respecting spheres and forces,—the law of distinction of degrees. We turn then to the electric force.

#### ELECTRICITY.

If, as has been said, the intra-molecular channels are so fine that the second aura can stream through them but not the third aura, the phenomena of the magnetic force ensue. But if the particles, corpuscles, or effluvia given off by an object have pores or sinuses in its interior molecular texture large enough for the bullæ of the third aura to stream through them, phenomena of a type analogous to those of the magnet, but of a

lower degree, ensue. These are the phenomena of the force of electricity, of electric charges, and electric spheres. (3 *Prin.* V, § 21.)

The spheres of electric radio-emanations with the sort of vortex whirl of the ether formed through them are not permanent. They are easily broken, dispersed, and scattered. For the ether bullæ are not vortex-shaped like the aura-bullæ, but round; and the vortices they form are nearly of the same form (3 *Prin.* V, § 4), and thus cannot be closely and as it were coherently colligated. Yet a great turbinated whirl in the ether is produced.

These effects of the electric spheres and ether-whirls are very obvious and gross; and the forces and currents of its circuit urgently lay hold of all loosely textured bodies, and the grosser particles of adjacent spheres. For the particles composing a sphere of this type are relatively large, and by the flow of ether through their wide pores, a wide turbinated flow is set up in the ether round about. Thus the stream of its gyre cannot but act with urgency upon every sphere, everything not too heavy, which comes in its path, bending, pushing, and soliciting it to fall into its own stream of motion. Indeed it is able to penetrate into the surface of loosely-textured bodies, and act upon their very molecules with a certain strain and stress.

Moreover, these grosser effluvial particles which form electrical spheres are of a size and of a force of movement, sufficient for them to be able by the mere force of their stroke and bombardment against the elastic ether round about, to set that ether into undulatory vibration, that is, into the vibration of light. This is the cause of phosphorescent light. Phosphorescence in organic forms is indeed the offspring of the marriage of the revolving reaction of the ether with the grosser effluvial spheres or radio-emanations flying off from organic forms. With creatures of the deep sea, who have distinct lantern-like organs giving off a phosphorescent light whereby they illuminate the sea along the paths of which they hunt their prey, this light is produced by grosser radio-emanations of this kind, given off by their organic tissues,—emanations



of particles of sufficient size, and moving with sufficient momentum, to set the ether in the interstices of the water-molecules into the undulations of light.

#### THE LAW OF SPHERES.

Swedenborg's theory of the magnetic force is thus a theory of molecular vortices. The magnetic mass is composed of little magnets, and the sphere given off from the mass is a sort of smoke gathered in the immediate vicinage of the parent mass, every particle of which is capable of acting as the centre of a vortex in the second aura.\*

From Swedenborg's doctrine of magnetism two things are seen to be involved: *First*. The flow and action of an aura, set into a vortex-whirl of small size. *Second*. The existence of a volatile particle to serve as the permanent centre and stimulant of such active vortex-current.

In this a universal of creation appears. The sphere of the Divine Proceeding consists of the active ethers or auras. These are volumes of bullular particles, and, as substances, they are the forces of the universe in very form. They are the Divine Proceeding in grades of atmosphere or use; and all their motion is natively and inevitably along some form or type of circular line.

"The Divine Proceeding is what is extended in the universe, and is the Divine Truth and the Light of the Spiritual Sun. Hence the inmost of the spiritual world is this; and this is that from which nature has taken origin; and this is extended in the created universe. It is afterwards formed successively into spheres the last of which is the natural atmosphere of the world. (*Athanasian Creed*, 191.)

The sphere proceeding from the finite forms of the universe,—that which is as it were their proceeding as units or integral wholes in emulation of the Divine Proceeding from

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\*It is to be noted that Clerk-Maxwell's thought and Hertz's have led to the same conclusion; and the theory of magnetism as a theory of molecular vortices is perhaps one of the best substantiated theories of all modern work. That its great confirmation lies in the fact of Swedenborg's affirmation on the subject, is of course, to New Church men, a foregone conclusion.

God as One,—is a sphere consubstantiate with their own matter; a sphere of particles, inert, not active; angular, not bullular; a salty and oily sphere, if I may so put it; every particle of it expressing in minute image and potency the very form of reception which constitutes the recipient character and potency of the parent wholes or integers. Sphere for sphere of proceeding, these two spheres,—the Infinite Active from the one God, and the finite reactive from all objects existent as coherent wholes emulous of the Infinite Individual,—look across one to the other. They are very opposites, as of first and last, and very complements. In order to the production of every force upon the plane of effects both must be involved, must combine. From every finite body are given off molecular particles, recipient, reactive, relatively passive; each a replica in little image and likeness of the form of the parent; each full of little channels, like vessels, outlining the curve of its reception of the Infinite. This sphere of particles, which is as a sphere of most fine dust breathed out into the ambient atmospheres from the very substance of a finite body, is laid hold of by an active atmosphere constituting some plane of the Divine Proceeding; which atmosphere makes the passive particle of the sphere the centre of a whirl or minute ether-vortex sustaining that particle, buoying it, giving it wings, force, delicate polarities; potency of application and colligation with like vortices into long lines of force; and, as it were, organic fibres wherewith new forms are textured.

One thing more may be educed from the story of the molecular vortices to which magnetism is due, namely: That the atmosphere which thus lends itself to embody and wing the particles of a finite sphere, is able to wing only those particles the minute vessels or inner foramina whereof are of a fineness approaching its own stream. To others its best force is as it were intangible and non-existent.

There is one gross illustration of this which may be interesting. If various objects be dropped between the two arms of a large and powerful horseshoe magnet, very different results ensue according to the substance of the objects. If a block of wood be dropped through, it falls as through empty air.



If the hand be placed in the space no sensation of resistance is apparent; and so if the head be introduced. To all feeling the air between the space is the same as any other portion of the air in the room. But let now an iron ball be dropped through that space, and, so far from its falling as if through empty air, as soon as it comes within the lines of force connecting the two arms of the magnet, its rapidity is arrested and it begins to fall as slowly as though it were boring through mud, or melting its way through a layer of wax. For the iron ball is surrounded by effluvial particles the foramina of which are of a fineness consonant with the diameter of the magnetic aura, and are as it were the very mates and consorts of that aura. Thus they are laid hold of everywhere and powerfully by the magnetic vortices; for they find as it were their own society with which they instantly form ties. But substances which do not present a sphere of the same nature and plane as that of the magnetic aura and vortices, have nothing with which that aura can conjoin its own currents. Such substances may therefore be in the field of its utmost force, and yet be not aware that any force exists in that field at all.

The law here exemplified is one of widest application. Possibly the Memorable Relation of the man who was in the midst of the inhabitants and activities of a higher heaven and did not find it out, but insisted that there was nothing but empty space around (*Heaven and Hell* 35), is only an instance of this same law acting in organic living forms. For that matter, the fact that the waves of the ether strike all over the ear, and the ear never finds it out, but the eye only, is a simplest case in point.

In this story of the factors which enter into or constitute the forces of magnetism and electricity, we see great simple instances of that universal law of which the Writings are full. No effect, that is, no phenomenon apparent on the plane of effects, can be produced without the juncture of an active and a passive, thus, without the similitude of a marriage. (*S. D.* 2722.) The actives are the atmospheres or planes of Divine Proceeding; the passives are the spheres of fine fragments given off by the finite individua of creation.

Both the magnetic force and the electric exist by virtue of

such a marriage or conjunction. The Divine Proceeding or atmosphere, as it were, adjoins itself in a general manner to the sphere proceeding from a finite form; and, taking each particle of that sphere, makes it the centre of a minute circulation or vortex which runs through the interior channels in that particle, and so flows and reflows continually. All the forces of nature, the most powerful things that we know, are such an adjunction of a current of the imponderable ethers, the active atmospheres, auras, with the spheres of radio-emanation around about tangible masses.

As already noted, mechanical forces are those between masses, and are due to the action of mass on mass. But the magnetic and electric forces, and all those forces whose reach is wide and imperative,—every vital force, for instance,—are forces in which the masses of substance or matter are not so immediately concerned as the radio-emanations or spheres given off from and by those masses. The elementaries, the auras, lay hold upon those mere spheres, and by adjoining their own powers thereto, wing them as it were, and make of them actual forces apparent upon the plane of effect. Thus that which is of the greatest service,—which lends itself as a factor to the greatest force,—is not the tangible body or mass itself, but the radio-emanation from that mass, the smoke of the incense of its interior constitutional activity continually ascending and diffusing itself abroad.

That these forces of magnetism and electricity in practical manifestation are due to some such adjunction of an imponderable ether as an active, with infinitesimally small particles given off by masses of matter as a passive, is a concept which has been attained by the rational thought of some of the world's workers in some departments of science. Concerning magnetism and electricity KELVIN in his "Geology and General Physics," p. 547, states that it seems most satisfactory to suppose them chiefly a motion of ether with a comparatively small but not inconsiderable loading by fringes of ponderable molecules carried with it.

Swedenborg's law that different ethers or atmospheres are concerned as the active factors in magnetism and electricity



has also been approached in a general way by a concept presented in CLERK MAXWELL'S study of the lines of physical force around a magnet. Commenting on the fact that a current of electricity cannot be set up without exciting a current of magnetism, and that the magnetic current always moves at right angles to the current of electricity; and on the fact that the converse of this is true, namely, that a current of magnetism cannot be excited without setting up a current of electricity at right angles to its own direction, Maxwell concludes that the ether element to which the electricity is due, must be in the nature of large spheres or vortex-rings embedded in a medium inconceivable. He says also that the latter, the surrounding or matrix element, must consist of spherical particles or vortices, but inconceivably smaller than those to which the electric current is due. Thus the interstices between the larger spherical or vortex-rings,—to a current among which the electric current owes its origin,—are filled by units inconceivably smaller; and to the movement or current of these units are due the magnetic currents. Thus he accounts for the fact that the large electrical vortex-rings cannot move without exciting a current in their matrix medium; nor the finer matrix medium be set in motion without inducing a motion in the grosser entities embedded in it,—these mutually induced motions or currents always necessarily flowing at right angles to each other.\*

Picturing the mass in rational imagination, such a differentiation in the common ether-field, that is, the co-existence therein of entities of these two types,—a larger embedded in a matrix of finer,—a current set up in the grosser forms would give rise to the phenomena of electricity. But if the condition of those larger units, to the onward flow and movement of which the electricity is due, be considered, it will be seen that they cannot move in a steady circle and current in any direction, without as it were stirring up a series of transverse waves

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\*See paper "On Physical Lines of Force. Part I: *The theory of molecular vortices as applied to magnetic phenomena.* Part II:

*The theory of magnetic vortices as applied to electric currents,"* by L. G. Beekman.

in that finer more imponderable medium wherein they themselves are embedded. Conversely, no current of onward movement can be initiated or take place in that finer, interstitial, imponderable medium without disturbing the grosser particles embedded in it, and setting up currents among them, the direction of which will be transverse or at right angles to their own. A general illustration of this may perhaps be the fact of a swimmer in the ocean, or of a great body advancing on its way in a fluid medium. Every motion of onward progress of the grosser body throws out transverse waves among the molecules of the watery medium through which it advances.

A second law looks out of these illustrations. It is seen that among these radio-emanant spheres, salts, angular connective particles, there are distinct degrees, degrees according to our New Church technical meaning. Not only does the *PRINCIPIA*, with its references to the magnetic and electric forces, set the matter forth particularly, but in the *ECONOMY OF THE ANIMAL KINGDOM* the statements are explicit:

"The reader may perceive that salts are divisible into three generations, families, degrees or orders; and that the saline particles of whatever order, are all similarly cubical or pyramidal; that they are all hard or inert corpuscles, never movable one among the other without the aid of either aqueous or atmospherical substances; that they are of themselves fixed and have a tendency to impart a fixedness to other things; that they are neither expansile nor elastic; and that they temper in different manners the fluidity of active substances. But the salts which are of a superior degree are more universal, less compounded, and more perfect than those which are of the inferior. The conceptions to be formed of them severally must be perfectly distinct, and must be expressed by different words." (1 *E. A. K.* 73.)

And what is true of "salts" or connectives strictly, is true of salts or connectives broadly, namely, as the radio-emanation of imponderably small fragments of the very structural form, occurring around all finite individuals. Moreover, it is also true of oils and spirits,—whether those terms be used strictly or broadly.



# THE NEW PHILOSOPHY.

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## Editorial Notes

The attention of our readers is directed to the announcement of the Annual Meeting of the SWEDENBORG SCIENTIFIC ASSOCIATION, which will be held in Philadelphia, May 15. The place of meeting is fixed by the Association's charter, but it had been hoped that an additional meeting might be held during the present year, in connection with the meetings of the GENERAL CONVENTION in Boston. In accordance with a unanimous Resolution to this effect passed by the Association last year the authorities having charge of the programme of the GENERAL CONVENTION were in due time communicated with. They replied that they had found it impossible to arrange for a meeting of the ASSOCIATION as desired. And so, perforce, the matter has fallen through.

Since our last issue four more subscriptions have been received for the proposed reprint of Swedenborg's ANIMAL KINGDOM,—Mr. C. Pryke, Broomfield, Engalnd, the Rev. Homer Synnestvedt, Bryn Athyn, Pa., and the Rev. F. E. Gyllenhaal and Mr. O. A. Bergstrom, Denver, Col. This brings the number of subscribers up to thirteen, leaving only one hundred and eighty-seven more subscriptions to be received to make up the required two hundred.

The present installment of THE FIBRE completes Part I. of that work. In the Latin edition this Part occupies 157 pages; Part II., On the Arachnoid Tunic, 17 pages; and Part III., On Diseases of the Fibre, 75 pages. It will be seen, therefore, that since the commencement of the translation in October,

1909, two-thirds of the work, all but nine pages, have been completed.

We have thought it advisable to omit from our present issue the continuation of Miss Beekman's valuable *PHYSIOLOGICAL PAPERS* not only because of the inadvisability of dividing the present installment of the *FIBRE*, but also because Miss Beekman's *Fourth PAPER* is one of some length, which cannot profitably be presented in short divisions. We hope to print the first part of this *PAPER* in our July issue.

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#### THE DOCTRINE OF FORMS APPLIED TO THE THREE KINGDOMS OF NATURE.

The concluding portion of the work on the *FIBRE*, printed herewith, constitutes what may be considered as the second part of a treatise on the *DOCTRINE OF FORMS*, the first part being the installment printed in our October issue. In these two parts the student will find the most complete consecutive treatment of the doctrine of forms to be found anywhere in Swedenborg's writings.

The first part presents the doctrine itself and its exemplification in the forms of the "elementary Kingdom," that is, in the kingdom of the atmospheres, including also the angular forms of primordial matter, wherein the atmospheres cease. These forms of the atmospheres, or, what is the same thing, the forms of their determinations or actions, are called "forms of the universe," "forms of the world" and "forms of nature."

The "forms of the Universe" include all forms from first to last; that is, from the perpetuo-celestial, or spiritual form—and even from the Divine form considered from the side of creation,—to the angular form which is the form of the material itself. Of these forms, only the Spiritual, and, of course, the Divine within it, can be said to be living. It is the living, breathing, perpetually animating atmosphere, or, if you prefer, sphere, which proceeds from God the Creator, and conveys, as it were, to the ultimates of nature, the uses and ends of the Creator as the transcendent gifts of Divine Love. It is the Divine proceeding as Use.



Below this universal form, this form of a universal aura which alone is living, lie the "forms of the world" or the "forms of nature" (*Fibre*, n. 269), which in themselves are void of life and serve only to convey life. These and the other are all treated of in the first part of the Doctrine of Forms.

But in addition to the forms of the universe, or forms of the world, there are also organic forms, that is to say, forms built up from the ultimates of earth, but framed by the forms of the universe to be responsive to themselves, and to manifest their endeavors or uses. These are the forms of the three kingdoms of nature, the animal, vegetable, and mineral, besides which "there are no other forms" (*Fibre*, n. 269). It is these that are dealt with in the second part of the doctrine of forms.

It is only by implication, however, that this second part deals with the forms of the vegetable and mineral kingdoms. Specifically it is devoted to the forms of the animal kingdom, and more particularly to the forms of the human kingdom. The forms of the animal kingdom—that is, as regards brute animals,—are images and correspondents only of the "forms of the world;" that is to say, their finest and inmost organism responds only to the forms of the magnetic atmosphere proceeding from the sun of the world. To this alone do they throb in answering animation, presenting to outward view its gifts and uses. They are microcosms, but only as regards that world which commences with the natural sun. In them the "forms of the world" descend and ascend, but not the spiritual form or form of life, except by the other forms as vicegerents. Hence when their corporeal frames die, they themselves also cease to be.

But the human kingdom is truly a microcosm. It is an image of the universe,—of the whole of creation. In this kingdom the finest and inmost organism is framed responsive to the Spiritual Form which is truly living; to this does it throb in answering animation, presenting to outward view its supreme gifts of life, intelligence and wisdom. Hence the forms of the human kingdom, though, considered merely as to their constituents they are dead, yet by virtue of this supreme and

eternal gift bestowed by the living forms of the universe, are also to be called living forms or forms of life. And when their corporeal frames die they themselves still retain those "finest substances of nature" by virtue whereof they receive the gift of life eternal.

The forms of the human kingdom are microcosmic effigies of the forms of the universe. As in the macrocosm, so in this microcosm, those forms descend as the Divine proceeding as Use. But in their descent they clothe themselves with substances that have risen from the earth; these they frame as images of themselves, and finally they produce them as the human form framed in the womb and born into the world as the ultimate image of the Divine Human Form of the Creator.

In human birth Forms descend and frame an image of themselves on the earth. In this image they are again to ascend, and they do this when man lives in the world the life of heavenly order, compelling himself as a vessel receptive of life to be submissive and obedient to inflowing life. Then the "forms of life" which proceed from the Creator, those forms which have framed the human organism to respond to themselves, bestow upon them their own perpetual gifts to be as it were the very possession of the organic forms themselves, so that as God lives, they also live and have wisdom and intelligence. It is by virtue of this perpetual gift that human forms also may be called spiritual and living. (*Fibre*, n. 269, 280.)

The first of the forms in the human Kingdom is the spirituous fluid and its simple fibre,—or more properly, the simplest fibre, which is the first and universal of the human being, the future man. It is this fibre that is the all in all of every man. It is this that weaves the whole of the body from inmosts to outmosts; it universally reigns in the body when formed, and is in the perpetual conatus to impart to the body its gifts of intelligence and wisdom. This fibre with its contained spirituous fluid is the soul, considered organically. It is the very form of the body; for the body proper consists solely of earthy particles which contribute nothing more to the form than to enable it to descend and manifest its powers and ends in the ultimate world.



## ANNUAL MEETING OF THE SWEDENBORG SCIENTIFIC ASSOCIATION.

The Sixteenth Annual Meeting of the Swedenborg Scientific Association will be held in the Parkway Building (Room C, seventh floor), in the City of Philadelphia, on Thursday, May 15, 1913, at 2 P. M.

A meeting of the Board of Directors will be held on the same date, at 10 A. M. in the office of the Association at 1011 Arch Street, Philadelphia.

REGINALD W. BROWN,  
*Secretary.*

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## THE FIBRE.

## CHAPTER XVII.

THAT THE SIMPLE FIBRE IS OF A CELESTIAL NATURE.

274. *Before we gird ourselves for a treatment of the simple fibre, let us premise the universal rule of the derivation of forms.* The nature of the series in the derivation of forms has been explained just above, n. 273, but I have not reduced it to a universal rule. *Namely, That the form of parts, individuals, substances, or units in themselves, is always superior to the form of the volume, or of the parts of such units among themselves.* They are called parts when they are endowed with figure and size; but when elevated to superior nature, they put off the qualities of figure, and are no longer called parts but simple substances or units,—as they are called also by philosophers, ancient and modern; in other respects they may be called individuals. Meanwhile, that the form of the individual is prior to the form of the volume of the parts, and superior and more perfect, has been shown above, n. 273. For the compound cannot but be posterior to and more imperfect than its components which are simpler and purer; and, therefore, when a compound is resolved it relapses into a superior or more perfect sphere of nature. *Or, that we come to a superior form only by the division or destruction of the*

*part or unit, and to an inferior form only by the gathering together of such parts, that is, by composition.* That there is no ascent from the substance of an inferior degree to the substance of a superior except by the division or destruction of the unit, see Transactions I, n. 158-161, and II, n. 222, 290. *Thus is it in the macrocosm or in the world, and thus in the microcosm or in the animal body.*

275. *From these considerations it follows that if the form of the blood vessels be circular, then the form of the medullary or nerve fibres is spiral, and the form of the simple fibre is vortical; and, finally, that the form of the individuals, substances or units which raise up\* and determine the simple fibre, (see n. 254), is celestial. Thus fibres are elevated in due order from the next to the last all the way to the very first form of nature. For blood vessels are compounded of nerve fibres, nerve fibres are raised up by the simple fibre, and the simple fibre is determined by its individuals which are so many simple substances. Compare above, n. 257, 258, 259. The origin and derivation of blood vessels from fibres will be dealt with in a special chapter. This proposition is true not only in regard to the composition of fibres, but also everywhere else in the body, as, for instance, in the great heart. This heart is simply expanded and constricted, like a circular form; but its constituent parts, or the motor fibres extended from the upper edge of the base obliquely, downwards, and crosswise, at last wind around after the manner of gradual spirals. So also in the brain, in which the cortical substances, led around into intestinal tracts, as it were, perpetually go and return into harmonies (*numeros*) and gyres emulating those of the spiral. The medulla spinalis also winds its fibres into similar gyres; whereby it comes to pass that their reciprocal motions carried on with ease and without any sense of resistance, do not cease until they themselves cease to live. That*

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\**Excitare*, the word here and elsewhere translated "raise up" might, with equal correctness, be rendered "rouse up" or "excite." Both meanings are involved, for

that which raises up or constructs its organ or receptacle, also rouses up or excites that organ to action, *i. e.*, vivifies it.



nature has transcribed its whole power of action into the spiral fluxion is clear from things obvious to the sense, as for instance from the screw; for the more gradually the spirals or oblique grooves of a screw are raised above the horizontal plane, the more do resistance diminish, weights disappear, and inert forces become elevated more nearly to the active, nay, the spontaneous forces of nature. What then would not be the case in forms perpetuo-spiral or vortical? and what not in celestial forms? Is there not in these the beginning of the spontaneity of nature?

276. *Such is the mutual ingeneration and composition of fibres and vessels in the animal body, and such is the derivation of forms; but in order to their subsistence, it is necessary that they also be distinct, that is to say, that posterior forms, or vessels, form and occupy their own sphere, and prior forms, or fibres, theirs. See above, n. 273, and Transaction I, n. 602, 603. Therefore they are allotted places in such way that ultimate fibres or blood vessels hold and infill the body proper and its provinces, medullary fibres the cerebrum and cerebellum, and simple fibres the cortical substance itself, which resides in the supreme place. The cortical glands which are the origins of the fibres are woven of none other than simple fibres, as is shown in Transaction II. Thus, comparing the body with the lowest sphere, or with the sublunary region, its heaven is the brain divided into orbs and hemispheres, while in the higher place or above heaven resides the cortical substance which pours out its fibres like rays through the brain into the universal body.*

277. *Thus the microcosm or animal world is likened to the macrocosm or universe, wherein are spheres celestial, sublunary, and terrestrial. The likeness also lies in the fact that the sphere which holds the supreme position or which represents heaven is also within and most nearly present in all the inferior spheres. Thus the brain and more especially the cortical substance which is the common sensory and motory of all parts of the body is present everywhere in the inferior spheres; and it not only contemplates them but also governs them at its nod and will; and if it were not most intimately*

*present within them by means of fibres, the several parts in the kingdom, together with their wholes, would come to ruin.*

278. *But in the cortical substance, or inmosty in the supreme heaven, the soul which partakes of the divine essence, has, like a deity, fixed her abode. For from this substance and by means of it, she discerns and disposes the several things in her world and system, and in each of them she provides that order shall be observed. To her, therefore, within her kingdom, is assigned a certain species of omnipresence, power, knowledge and providence. Compare Transaction I, n. 258, 259. That she has also formed and, as it were, created all things, see *ibid*, n. 253 *seq*.*

279. *Since then the simple fibre is produced immediately from substances of a celestial form, it follows that it is not of a terrestrial nature, but, far removed from terrestrial forms; having its origin in the purest ether, or in heaven;—contrary to the sentiment of Aristotle and the peripatetic school, who calls the fibre earthly; but, Oh, how far removed it is from this! Placed at the height or summit of nature, so that it may almost be called nature herself in her first infancy, it is that in which is the principle of natural forces, conatuses and motions, and from which all other forces flow. See what was said above (n. 266) with regard to the celestial form, with which the present points coincide. Its qualities cannot be expressed in words,—qualities which, if they should be expressed, would appear like paradoxes, to wit: That it consists of simple substances, as of so many units or monads, which are void of figure, extension, size, gravity, and levity, and hence are not material; and, That they are so many exemplars representative of their universe or microcosm; that is, that in themselves, they contain in potency everything in the universal corporeal system which, after formation, comes under the senses and becomes apparent.*

All these particulars may be seen explained in the preceding chapter on Forms. *From such forms, natures, or heavens, is raised up and determined the simple fibre from which are all compound fibres.*



## CHAPTER XVIII.

THAT THE SIMPLE FIBRE IS FROM SUBSTANCES OF A SPIRITUAL NATURE, AND THUS IS PARTAKER OF LIFE.

280. *In addition to forms purely natural, or of the world, there are also forms which are partakers of life and intelligence. These likewise are superior and inferior, prior and posterior, thus more or less perfect and imperfect. All are subject to the verimost spiritual form, for they are created for the reception of its life and intelligence and are accommodated thereto. Wherefore they are images or likenesses of its operations; and therefore they also are called spiritual forms. These points may be seen better explained above, n. 269, and in Transaction II, chapter iii [n. 231-239 On the Human Soul].*

281. *Of this kind are those first forms in subjects of the animal kingdom,—superior and more perfect in men, inferior and more or less imperfect in other animals, and most imperfect in insects. These forms, in like manner as forms purely natural, descend by order of derivation and by a successive series, even to the ultimate world; and suitably to their nature, they construct and create the microcosm which is called their body. For they are exemplars representative of their universe, and contain, as it were in a type, whatever afterwards comes to view in the constructed body. On these points compare the whole of chapter iii, Transaction I, [n. 241 seq.] On the Formation of the Chick in the Egg. Fibres are the determinations of their forces, and, at the same time, are rays of intellectual light,—fibres which they send forth from the brain as from their heaven, and by the mediation whereof they act and sensate. Thus these forms may be called so many powers, lives, and intelligences.*

282. *These forms, because they are entities of primitive nature, and are the beginnings of the forces, conatuses, and motions in their own system, and depend immediately upon the spiritual form and its influx, can be no other than those celestial forms of which we have already treated, and which*

raise up and determine the simple fibre. For if they were superior to celestial forms they would be above nature, and in like degree with the divine spiritual form. Therefore, because they are these same celestial forms, the fibres raised up by them are consorts of life.

283. Now, in that the fibre is from substances of a spiritual nature and is thus itself partaker of life, it follows that the medullary fibres also, in their own manner, are living. For in the medullary or compound fibre there is nothing substantial save the simple fibre; therefore, in that fibre there is a more common, that is, a more obscure life. This is the reason why every modification of the ether or air, as soon as it strikes a sensory organ constructed of fibres, begins to live, and is called sensation.

284. Posterior or more imperfect forms of this kind, which are the first forms of other animals, are also created for the beginning of motion and at the same time for the reception of life. Although they are posterior, nevertheless the spiritual form flows into them immediately; scarcely otherwise, if we may use the comparison, than as solar light flows both into objects or substances which are more simple and into those which are more compounded. But the more simple they are, in that they are more perfect, the better and the more distinctly do they receive it, and the more singly do they apply its virtue and goodness to themselves. See Transaction II, n. 261-265. But they are inferior forms, and are compeers to those which we have styled vortical. Wherefore many of them are, as it were, living magnets which, of themselves and their own nature, know the quarters of the world. That to the vortical form are due the marvellous phenomena occurring around the magnet, see above n. 265 [b], and further, in Transaction II, n. 338-347. Nor are they capable of receiving superior life, that is, intelligence, still less wisdom; for they are as distant from man as is the vortical form from the celestial.



## CHAPTER XIX.

THAT THE SIMPLE FIBRE IN ITS BODY IS ANIMATED PRINCIPALLY;\* OR, THAT IT FLOWS FROM THE SOUL IMMEDIATELY, AND IS OF ITS SUBSTANCE.

**285.** In this chapter I have appointed to treat briefly of the soul and its nature and essence. But what the soul is, and what its nature, is a subject which does not suffer itself to be delivered in a few words, nor in bare words, without illustration from examples and philosophical axioms, and without the authority of the learned,—an authority which, to human minds not so far refined as to penetrate to the minutest point in determining whether those things which sound like truth and are said to be such, are really true, bring much light because much faith. That I may satisfy the reader in these matters, I have decided to enter upon a special treatise on the commerce of the soul and body, and on its state in the body and also after the death of the body; and at the same time to bring forward the opinions of the learned, and to set forth in what way they are consentient and dissentient.† Here I could do no other than put forward, as though by way of preface, such things as are seen to conduce to an illustration of the point that this celestial and spiritual form, of which I have treated in the preceding pages, is the same as the soul. Wherefore, essences and intelligences such as human souls are, are frequently called, by philosophers, nay, and by theologians, forms, such as angelic forms, spiritual forms.

**286.** *The universal body is animate; otherwise it would neither be, nor live. For that in the body which is, and that which lives, is the soul. The body without the soul neither ex-*

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\**Principaliter*, from *principum* (beginning).

†This promise was fulfilled. at any rate in part, in the work on the SOUL or RATIONAL PSYCHOLOGY; see the author's preface to that work. See also the little work on THE SOUL AND THE HARMONY OF SOUL AND BODY, in

Posthumous Tracts; this was written soon after the work on the FIBRE, occurring in the same MS. volume towards the end. An earlier treatise on the same subject is translated in SCIENTIFIC AND PHILOSOPHICAL TREATISES, PART II.

*ists nor subsists nor is moved; but the soul without the body both exists and subsists and also acts; for the soul is the beginning of its body, and also its representative exemplar; therefore the body is the type, image, simulacrum of the operation of its soul.*

287. *There is nothing existent in the universal world, nothing in the threefold kingdom of the world, animal, vegetable and mineral, yea, neither is there any society, nor action, nor utterance and speech, within which is not its own soul. Wherefore, unless we dispose the several parts according to the form of the soul itself, which is the essence of the things that follow, we are diverted from the path of nature. So also, unless we perceive things which exist, as being correspondent to their soul, we do not penetrate within the surface of things, nor to their very kernel or marrow. And that is the soul of a thing which is first, which is in seconds, which is the universal regnant in thirds, and to which everything owes the fact that it is such as it is. That which, according to the order of nature, has been made such as it is, that is, has been formed by the soul, is called its body, and this is the more perfect in the degree that it is a type, image and simulacrum like to its soul. Therefore, he who calls the soul into doubt, necessarily calls into doubt the existence of every single body, and of every thing that exists in the world; for corporeal structure and form is from the soul, and is the ultimate image of its forces and operations. By reason of this, the soul is the form of forms of its body.*

288. *Therefore none can be so insane as to deny the existence of the soul, unless he wishes to deny his own existence and that of all the things which are within him and which are without him. Now because there is nothing existent in the created universe which has not its own and proprial soul, the enquiry to be made is, not that the soul is, but what is its nature in each single subject. It is from form that the soul is such as it is, and that it is of this or that genus or species. By soul we ordinarily understand that,—either in ourselves or in brutes,—which is, that is to say, which lives. But there are souls of every existing thing, both in the vegetable kingdom and in the*



mineral and in the universal world; or, everything, especially in compounds, that has any existence, from things prior [has its own soul]; for the soul is that which is first in them and reigns universally, and without which they would not exist. Wherefore, in familiar discourse, we say that such and such is the soul of society, the soul of speech, the soul of acting; and because there are so many genera and species of compounds in each kingdom, nay, in those things which are called accidents and modes, therefore, the soul is not living except in the animal kingdom. The soul of angular forms is the triangle, for this it is that dominates in all forms of this class and degree; nor is it really the triangle, but the essential determination or the form of the triangle, which makes it to be such as it is, that is to say, inert, and not of itself suited for any motion. So also in other cases. *That substance in a subject which is the first substance that has such form within it, is said to be its soul; which substance is therefore called simple substance, the one, or the unit or monad.*

289. *In order, therefore, that it may be known what the human soul is and what its nature, recourse must be had to form itself. According to what has been said, this form, as to its nature, is celestial, and as to its life, is spiritual, simple, void of part, size, extense, figure, motion, gravity, and levity, not corporeal nor material.*

290. *But because there is no form without determination, and because no determination can be conceived of without fluxion, and no fluxion without the idea of part, extense, figure, motion and matter, therefore these several properties are to be represented as though they were within,—but by analogy or eminence; for what is determined therein essentially, whence arises the form, is not nothing, but is something. But, by elevation from power to power and thus by degrees, everything which partakes of figure, motion, and matter, puts off that which has held it finited and limited. For when forms are carried up by their ladder, at each step something earthy, material, and finite is cut away and put off, and a certain celestial, perpetual and infinite is superadded and put on; see above, n. 271. And thus puts off the very terms whereby finite*

*things are represented. But words are required, if such there be, within which is a perpetual and infinite such as is within superior forms; but then one must speak angelically and spiritually, or, during this life, must think abstractly, that is, in respect to such matters, must speak by analogy and eminence.*

**291.** *From these considerations it now follows that the soul is the same as simple substance within which is celestial and spiritual form; and hence that it is the same as those forms of which we have just now treated. From these forms, as from so many simple substances, is raised up and determined the simple fibre. Wherefore this fibre flows immediately from the soul, and thus in its corporeal system is animated principally, that is to say, is endowed with a celestial nature and a spiritual nature. Thus the several simple fibres are rays of the intellectual light of the soul, and determinations of its conatuses and forces, that is, of its will.*

## CHAPTER XX.\*

THAT THE UNIVERSAL SIMPLE FIBRE IS RAISED UP FROM FORMS  
OF A CELESTIAL AND SPIRITUAL NATURE.

**292.** *It is necessary that the simple fibre also be transpirable, be gifted with a pervious and exceedingly minute cavity, and thus be, in least effigy, an idea or likeness of its compounds. Otherwise neither itself nor anything whatever in the body which is animated by it, would take, and carry into act, its origin, progress, order, law, motor force, and sensation. Wherefore, the simple fibre without a perfluent analogue of a fluid would be a thread or line impotent of action. Confer, n. 253.*

**293.** *Because in the simple fibre there is the likeness of a cavity and the likeness of a surface such as exists in compound fibres, it follows that those most perfect forms or substances by which that fibre is raised up and determined, put on such a state that there are things which represent a surface and things*

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\*Several of the principles laid down in chapters xx-xxvi, are briefly presented in the opening

paragraphs of the RATIONAL PSYCHOLOGY, n. 1-14.



*which represent a fluid running through the cavity. In order that they may put on this state they must undergo accidental changes whereby they are rendered more or less active and more or less susceptible of life. What an accidental change is and what an essential, I have explained above [n. 241], namely, that an accidental change consists in their being able to be rendered more ample or more constricted while the form remains ever the same; as, for instance, if the circle become larger or smaller, still the essence of the circle is not then changed, but it is rendered more or less active. And thus they maintain such an order that the likeness of a surface and the likeness of a cavity is formed in the simple fibres. For the perfection of superior or more simple forms consists in their faculty of undergoing accidental changes.*

## CHAPTER XXI.

THAT THE SIMPLE FIBRE IS NOT SOLID, BUT APPROACHES RATHER TO THE NATURE OF A FLUID.

294. *The simple fibre, consisting of forms most pure, most active, and at the same time living, cannot but be in perpetual fluxion, that is to say, be determined by the fluxion of its substances. For the sole thing that induces rest on such substances is their determination according to a form other than that which is proper and natural to them,—and in the simple fibre this is not possible. As for instance, in the angular figure; for in this figure, they are able to be determined, not according to their own nature or form, because not into the circular or spiral or vortical form, but to an infinite number of centers which do not conspire to a form perpetually mobile; and because there are perpetual oppositions and collisions there arises rest and inertia. It is otherwise in the simple fibre wherein there is left to them entire liberty of fluxion.*

295. *What in itself and its own nature is fluid precedes what is solid; for in order that a solid may exist, subsist, and be moved at the nod of its simple, it must be determined and formed by a fluid and according to the nature of a fluid. Thus every solid must in its infancy have been fluid. The simple*

*fibre is ever in its infancy and flower of youth, because all other fibres and vessels,—and thus the universal body,—perpetually exist, subsist, are moved, and live by means of it. Therefore, if the simple fibre were solid it would be impotent of action, and this would be the veriest death of the whole system. That every solid in its primordial periods has been soft, yea, fluid, is a statement which I know not whether anyone can justly deny. For a solid consists of parts, and indeed of the minutest parts, which were not capable by their own means of coalescing into a mass. Still less was this possible in the animal body where the tunics of the vessels and fibres correspond in the minutest respects to the fluids running through them. In the first formation in the egg or in the womb all things are so delicately soft that there is not the least consistency; in time they grow together, and in old age they harden, whence comes rest, cold and death.*

296. *Nor is it any objection that the nerve, which is a congeries of fibres compounded by degrees from the simple fibre, is more or less soft or hard, and is coherent. For, as the nerve is resolved into its principles, so its solidity decreases and the fluidity of its constituent parts increases. The somewhat hard consistency of the nerve is also contributed to by the humors which run through the medullary fibres, and through the interstices of the fibres, and also through the interstices of the fascicles,—humors which are impregnated with saline and sulphureous corpuscles as with so many forms that are angular and are gifted with the force of inertia. Confer chapter x, [n. 188 seq.].*

297. *Anatomy itself also clearly demonstrates that the nearer fibres come to their origins or cortical substances the more tender and soft they are, nay, that at the least touch, they melt away into a little dew; so that in themselves and their own nature, the fibres are quite soft, so far as sense and touch reaches. What then is not the case with simple fibres which are set above our sense and touch? It follows, therefore, that the simple fibre is not solid and hard, as many have opined. Such as Aristotle, who asserts that the fibre is not only earthly but also solid, and from him the peripatetic school*



and also many of our contemporary philosophers ; and, moreover, some medical men, whose prince, however, Hippocrates, says that there is nothing existent in the animal body which is not transpirable and conspirable. Leeuwenhoek makes passing mention of a humor which was seen to result from disrupted fibres flowing together into a little dew, in the following words: "Moreover, I saw that many small vessels had degenerated into an aqueous matter," (n. 22) ; and elsewhere, "Certain vessels had flowed together into an aqueous matter," [n. 23]. This could not have happened unless they had been almost fluid. It is a fact in the light of experience that the beginnings of nerves, in the brains, are quite soft, although the nerves arising therefrom are more firmly, because more compactly, consistent,—a fact which is also mentioned by almost all anatomists ; see Winslow, n. 8, and Bartholin, n. 14. Nay, according to the observation of Ruysch, a certain mucous is visible under the pia mater covering the cerebellum, from which flow down still softer stamens. What then is not the case in insects, which themselves are, as it were, a delicate humor? An essence such as that which flashes through the simple fibre and excites it, when flowing is then in the circle of its nature and is borne whither its soul determines it. But howsoever it acts in its fluxion, there are in it, nevertheless, degrees of fluidity with the utmost distinctness, and these correspond with each other ; as is the case, in things visible, with the solid and the soft, and the soft and the fluid. For an essence of this kind can take on every ratio of variation that is possible in the universe ; hence arise harmonies.

## CHAPTER XXII.

THAT FROM SIMPLE FIBRES ARISE MEDULLARY OR NERVE FIBRES,  
AND FROM THESE BLOOD VESSELS.

298. *There are simple fibres, compound fibres, which we call medullary or nerve fibres.* From the description of the fibres in what follows, it will more clearly appear what simple fibres are, and what compound. Those are called compound which compose the nerve fascicle. This fascicle is not a fibre

further compounded, but it is an aggregate of fibres. Those fibres which we have called compound are the same as those seen by Leeuwenhoek through the microscope and shown delineated in his figures. For the sake of distinguishing them from simple fibres, we call them nervous or medullary, because they are the principal constituents of the structure of the nerve and of the medulla of the brain. *And there are blood vessels, or arteries and veins. From the simple fibre is formed the compound or nerve fibre; from the nerve fibre, both immediately and mediately, the blood vessel. Thus the simple fibre is the first fibre, the medullary fibre is the second or middle fibre, and the blood vessel is the third or ultimate fibre. By reason of this, fibres may also be called vessels; that is to say, the first fibre is the simplest vessel, the second fibre the middle vessel, and the artery and vein the vessel proper, or the blood vessel. Thus there are three degrees of fibres or vessels.* This is the reason why anatomists indiscriminately call fibres vessels and vessels fibres; for the word vessel denotes a minute channel through which circulates a fluid. *Besides these, there are also fibres of a middle nature, or corporeal fibres, of which we treat elsewhere.* Respecting these see above, chapter ix [n. 188, seq.], and in the following Transaction on the Animal Spirit.\*

299. *As fibres or vessels descend by a threefold degree of composition, so also do the fluids or humors which run through those fibres or vessels. Through the simple or first fibre flashes that essence, truly animal, which we have said to be the very substance of the soul. See chapter xxi, [n. 294 seq.]. Through the medullary or middle fibre flows the second or middle animal essence which is called the animal spirit. Respecting which, see the following or fourth Transaction. Through the ultimate fibre, or the arterial and venous vessel, runs the red blood. These essences or fluids mutually succeed each other in the same order as do the fibres themselves. See these points treated in detail in Transactions I and II, consult Transaction II., n. 222, where the passages are referred to. Thus all of*

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\*See the little work on the TRACTS.  
ANIMAL SPIRIT, in POSTHUMOUS



*them may be called animal or vital essences, and also all of them may be called bloods, yea, all of them may be called the souls of their own world. That the blood is the corporeal soul, see Transaction I, n. 46. Therefore also Sacred Scripture affirms that the soul of brutes resides in their blood. Scripture also makes mention of bloods; as for instance, that the bloods of Abel cry for vengeance [Gen. iv. 10], and elsewhere frequently. For the one descends from the other, and the posterior is the vicegerent of the prior; thus the red blood is the soul's vicegerent in the body or in the ultimate sphere of the world. But now to the several fibres in order.*

**300.** *The simple fibre, even from its first origin in the cortical gland which it weaves, sinuously flashes like a ray, towards the ultimate points of the body; and by a wonderful circumvolution or form, which I have called the vortical, it raises up a little canal which is the medullary or middle fibre. Thus this latter is a mere membrane formed by the circumgyrations of the simple fibre. This medullary fibre derives its form of fluxion, which is simply spiral, from the vortical fluxion of its simple fibre,—according to the law of order in the derivation of forms. See the general rule of derivation in n. 274; and for the manner in which one form flows in order from another, and the spiral from the vortical; and also that the form of fluxion of the nerve fibre is spiral, see chapter xvi [n. 255 seq., especially n. 258].*

**301.** *The medullary or nerve fibre, by a similar mode of circumgyration, raises up and conglomerates fine channels which are least blood vessels, or arterial and venous capillaries; thus these vessels also are mere membrane formed by the winding of the medullary fibre. The reader may see the demonstration of these points in Transaction I, n. 146-154. But in that place I made no mention of the simple fibre, but only of exsanguinous blood vessels, or vessels which carry the middle or white blood, or that blood which is called the animal spirit. Therefore, the passage cited should here be further illustrated; but this cannot well be done except in the following Transaction where I have appointed to treat of the Animal Spirit, and also of the Corporeal Fibre. Meanwhile the reader*

will see it there illustrated that the blood vessel must take its origin from nerve fibres. *These vessels derive their form which is simply circular, from the spiral fluxion of the medullary fibre,—according to the law of order in the derivation of forms.* n. 274, and chapter xvi, [n. 255 seq.].

302. *From these fibres, that is, from the simple and compound fibre and the blood vessel, is produced everything which exists in the universal body. For there is nothing existent in any gland, muscle, sensory organ, and viscus except this threefold fibre most distinctly formed and woven with all variety. So also in the tunics of the larger arteries and veins, wherein is found nothing but a complexity of fibre and vessel.*

303. *The tunics of the larger arteries are five in number. The first or outmost of these is nervous on the outer surface and vascular on the inner.* According to Boerhaave, see Transaction I, n. 126. Moreover there are innumerable nerves which flow into the trunks of the arteries and veins; such, for instance, as the intercostal, flowing into the branches of the azygos,—and into the azygos itself and the vena cava,—into the aorta, and also into the internal carotid and everywhere else; upon which arteries they creep like ivy and then betake themselves towards the inner parts. So also over the pulmonary vessels, around which the fibres flow in the manner of a spiral. This is so obvious that there is not even room for doubt. So also they flow into the surface of the heart and its muscle; see Transaction I, chapter vii, On the Motion of the Adult Heart, [n. 460 seq.]; and this so evidently that, from the very determination of the nerve fibres, one may be allowed to judge as to the nature of the motion, or of the determination of the motion, of the heart and also of its arteries. In the macerated muscle of the heart Lancisi found nothing but fibres and blood vessels. [Trans. I, n. 463.] The cause of muscular motion can be evidently deduced from the influx of fibres into the blood vessels, and I know not whether it can be deduced from any other source. *The second is cellular and is also called glandular.* According to Heister and Boerhaave, Transaction, n. 120, 126, and elsewhere. *The third is tendinous; the fourth muscular, contextured of a great number of annular fibres;*



*the fifth or inmost is a membranous tunic, by some called also a nervous. Confer Heister, Transaction I, n. 120, and Boerhaave, n. 126. These five membranes are formed solely of fibres and vessels diversely woven together. From the first membrane, which is nervous and at the same time vascular, is produced the second or glandular; from this again the tendinous, made up of so many emissaries or ducts of the glands; and, finally, from this, the muscular. Thus are blood vessels raised up by the medullary fibres, both immediately and mediately; and thus in the animal microcosm as in the macrocosm, do forms mutually succeed each other. Respecting the tunics of the arteries and their derivation confer the whole of chapter II of the first Transaction [n. 116 seq.].*

## CHAPTER XXIII.

### THE FORMS OF THE ANIMAL KINGDOM AND THEIR SUCCESSION OR DERIVATION BY THE MEDIATION OF FIBRES AND VESSELS.

304. *Forms in the animal kingdom are as many as are forms in the universal world, which latter have already been treated of; nor do they differ in the nature of their fluxion. Hence they also are celestial, vortical, spiral, circular, and finally rectilinear or angular; but because they have in addition this property, namely, that they are living, these forms are called vital, and the first of them spiritual, and the rest organic. But that one form may be derived from the other and be procreated by it, there must be fibres, first simple, then compound or medullary, and finally blood vessels, which are so many essential determinations.*

305. *The first form, which is also the first form of nature and the first form of the life of this kingdom, is a celestial and spiritual form, properly the soul which is simple substance having this form within it. This also is the eminently organic form, and merits to be called the eminent organ of its body. Transaction II, n. 275. For it is the form of all the other forms of its microcosm; for the others, outside itself and like itself, as being derived from itself or to be derived, it contemplates as present in itself. The spiritual form is the soul; but the primitive cortices are of a celestial form.*

306. *The second form is the cortical and cineritious substance in the cerebrum, cerebellum, medulla oblongata and medulla spinalis, which is essentially determined by the first form or by its substances, by means of simple fibres. Hence it comes about that this form is vortical; and because the simple fibre is living, chapter xix, xx [n. 285 seq.] this form is intellectual. For within it is the faculty of perceiving, understanding, judging, and willing,—a property which it draws from its soul which is a spiritual form and is intelligence. This is the first organic form, or the first of the organic forms that follow. See the whole of chapters II and III [On the Cortical Substance of the Brain, and On the Human Soul], in Transaction II [n. 69 seq.].*

307. *The third form is the whole brain taken in a broad sense, which is determined by the second form or by its cortical substances by means of medullary fibres. Hence it comes about that this form is spiral. For the whole brain is circumvoluted and drawn into spirals; so also the medulla spinalis, and especially the fibres going forth from these two. And because the medullary fibre is living. For the entire second or medullary fibre exists from the first or simple fibre, chapter xxii, and thus lives a life not so distinct as the simple fibre but more obscure. It is inferior to the intellectual form, and is properly to be called the sensitive form. For within it is the faculty of perceiving the things which come in from the external organs of the senses, and also of imagining and desiring. For understanding and sensing, thinking and imagining, willing and desiring, mutually correspond to each other, as the power of a superior form to the power of an inferior form,—as will be seen in the treatise on Correspondences.\* Which property it draws from its intellectual form. This is*

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\*See the little work "Introduction to Rational Psychology. Part Second, On the doctrine of Correspondences and Representations" (3 Photo. MSS., p. 183 seq.). As its title implies, this is evidently the work promised

in the text. It was followed by "A Hieroglyphic Key of Natural and Spiritual Arcana, by Way of Representations and Correspondences," which was published after the author's death.



*the second organic form, if the spiritual form or soul is taken as being above all.*

308. *The fourth form is the heart, taken in a broad sense or together with the arteries and veins, which is determined by the third form or by the brain by means of blood vessels. Hence it comes about that this form is circular.* Blood vessels cannot properly be said to arise from the heart, though after they have arisen they flow into the heart; but they are raised up by nerve fibres, in accordance with the points which were brought forward in the preceding chapter. This was also observed by Malpighi in the incubated chick, namely, that the blood vessels do not at once reach their little heart, but first stand around and approach it gradually. It is evident also from the circumstance that the little heart, circumvolved with fibres, comes into existence after the brain. Therefore the brain rouses to action the blood vessels and the heart itself, and in the muscles determines them absolutely. Confer Transaction I, chapter iii, [On the Formation of the Chick in the Egg, etc., n. 241 seq]. *And because the blood vessel is living, though it lives a more obscure life.* The reason is, because it consists of mere simple fibres. Wherefore also the schoolmen set the seat of the soul in the heart, and believed, at the same time, that the sensory fibres were produced therefrom. *This form is properly to be called the animal form; for within the heart and its arteries is the faculty of acting, and, obscurely, of sensating.* Transaction I, n. 231, 232, 233. *A property which it draws from the brain.* For whatever is animated is living, and therefore also the blood vessels,—but in their own degree.

309. *The fifth form is the whole body, taken in a broad sense, which is determined by the fourth form, or by the heart, by means of motor fibres. Hence it comes about that this form is rectilinear and angular, such as it is in muscles, tendons, cartilages, and bones. And because the motor fibre lives in acting and acts in living, this form is properly to be called the corporeal form. For within the body and its members, viscera, and motor organs is action,—a property which it draws from its heart. This is the ultimate form, or the complement of forms, which corresponds to the first form in the soul.*

310. *Thus in the animal kingdom there are existent forms prior and posterior, and one succeeds the other and is derived from it; that is to say, from the spiritual form the intellectual, from the intellectual the sensitive, from the sensitive the animal, and from the animal the corporeal. Each prior form holds and embraces in itself all posterior forms in potency; and each posterior form the prior in actuality. Such is the succession and derivation of forms in the animal kingdom, which possesses this property above purely natural forms, that while acting naturally they also at the same time live spiritually, and so receive their name from a more powerful form.*

311. *Simple fibres are the essential determinations of the soul; compound or medullary fibres are the essential determinations of the cortical substance; nerves and fascicles of nerves, the essential determinations of the brain; blood vessels, of the heart; and motor fibres, of the body, for of these are made up the members and viscera.*

312. *Simple fibres are those by means whereof the soul modifies itself for the formation of its organic machine. Second or medullary fibres are those by means whereof the rational mind modifies itself in order that it may act out what it judges, concludes and wills. Nerves and fascicles of nerves are those by means whereof the brain modifies itself in order that the desires of its animus may be determined. Blood vessels are those by means whereof the heart determines itself in order that the things which superior forms regard, will, and desire may follow on to the effect. Motor fibres are those whereby are moved entire members and viscera which are the ultimate effects, whence come actions.*

313. *Simple fibres are determined and modified by the vortical form of fluxion; compound fibres by the spiral form of fluxion; blood vessels by the circular; and motor fibres by the linear. But as regards nerves and fascicles of nerves, these are not determinants but aggregates of determinants.*



## CHAPTER XXIV.

THAT THE UNIVERSAL FORM OF THE BODY, BOTH INTERNAL AND EXTERNAL, CONSISTS OF SIMPLE FIBRE ALONE.

314. *If by the simple fibre is raised up the compound or nerve fibre, and by the nerve fibre the blood vessel; and if in the body there is nothing except fibres and blood vessels, which compose the whole of organic form; it follows that it is nothing else than the simple fibre which constructs the form of the body both internal and external. Thus there is nothing truly substantial in the whole body save the simple fibre, and nothing in the simple fibre save the substance of the soul. Tendinous, cartilaginous, and bony structures also consisted, in their first infancy, of nothing but vessels and fibres, as is confirmed by the anatomy of the chick in the egg and of the embryo in the womb. Lancisi, in his treatise ON THE HEART, proves that the tendinous matter of the heart consists of muscular fibres closely united together. [Transaction I, n. 464.] That a muscular structure hardens into a tendinous substance, this into a cartilaginous, and this again into a bony, is evident enough; also that the cranium itself has once been a membrane yielding and soft; and so also the other bones, which are soft before they are hard, and fluid before they are soft. The umbilical vessels and the ductus arteriosus of the heart are changed in time into tendons; so also many other vessels, which are deprived of their blood and stopped up with a humor of alien kind.*

315. *The fluids that run through the fibres and vessels, and through the ducts constructed by these, are so many rivulets which make their passage and accomplish their circles within their little canals; but it is the canals themselves, constructed of the simple fibre, that shape the form, to which latter the fluids thus contribute no more than to sustain it. It appears as though some vessels or filaments were compaginated also of terrestrial matter; but this is caused solely by humors impregnated with terrestrial particles, which stop up those canals, and make it to appear as though the canals themselves were*

fabricated of terrestrial matter; as is the case in the bones, which when burned give off a urinous odor, and when boiled pass off into jelly. Nay, this is the case even with the vessels and ducts of the tunics; hence it comes about that we think the tunic itself to be of this nature.

**316.** *If the simple fibre be by nature celestial and spiritual, and if it be the essential determination of the soul itself, it follows that the form of the body both internal and external, is from a celestial and spiritual origin; and is the soul in ultimates.*

## CHAPTER XXV.

WHAT THE SOUL PROPERLY IS, AND WHAT THE BODY.

**317.** *The soul is the purest animal essence, celestial and spiritual, which raises up and modifies the simple fibre, and at the same time enters into the blood both white and red. All its individuals are most perfect, first, supreme, most simple forms immediately subject to the divine spiritual form, and created for the reception and influx of its operations. These forms, which therefore are lives and intelligences, are the soul. And because this constructs the whole animal form such as we behold it with our eyes, therefore the whole of it is in every part, and it is the one only substantial which reigns and lives in this whole system.*

**318.** *But what is the body? There are strictly earthly parts, such as saline, sulphureous, oily, aqueous, and others, drawn forth from the mineral and vegetable kingdoms, and also from the bosom of the atmospheres, which are within the red and white blood and the other humors arising from the blood, and which surround the blood. These are angular forms, inert, cold, dead, heavy, material and corporeal, and they are those veriest forms which constitute that which is called the body; nor do they contribute anything whatever to its form except that the soul can thus and in no other way, descend from its heaven and dwell upon the earth.*



## CHAPTER XXVI.

THE CIRCULATION OF THE RED BLOOD, THE PURER BLOOD, AND  
THE PUREST THROUGH VESSELS AND FIBRES; THAT IS,  
THE CIRCLE OF LIFE WHEREBY IS CARRIED ON  
THE COMMERCE OF SOUL AND BODY.

319. *At every turn of the circulation the red blood or the globules thereof, is resolved into the purer blood; and this again, or the globules thereof, into the purest; and passing through the fibres, it is again compounded; and so on.* The resolution of the red blood has been treated of above, n. 199, 200. [For the rest, see] Transaction II. n. 117-31, 165, 222, Transaction I, n. 92-96, 100, 148, 149, 150, 158-160, 371, 649. Meanwhile I wish here to add something more, since it is of importance that we be convinced of these matters; for in order that the one circulation may be continued into the other, it is not necessary that the blood be twice and a third time resolved. It is a known fact that the softer and better blood is withdrawn towards the brains, and that the viler is rejected, and this towards the liver, whence comes the bilious matter. That the blood is better when it is softer, more flexible and more divisible, is confirmed by Leeuwenhoek,—who is convinced of the fact from many experiments,—in the following words: “I saw that blood globules could be elongated, and could come out the more flexible in proportion as the blood was more healthy; that is to say, that they could be reduced into a longish figure, or one that was three times longer than their width.” He observed that when he was ill the globules appeared harder and firmer, but that when he enjoyed better health, as they became softer and more fluid, so they were better consociated with each other; from which he infers that death follows from their hardness. Transaction I, n. 29. He states moreover, that he has frequently observed their resolution, see above, n. 200; and that when they were subjected to a distillatory fire, they were actually resolved into spirits and oils. Reason also gives her support; for it is beyond all doubt, that the blood is not only born, but is also unborn and reborn,

that it may be fit for distinctly entering into and passing through the medullary fibres in the brain, and for producing in the corporeal system all that is conducive to its continuation and sustenance. The arteries and vessels themselves are split up into lesser vessels, and, finally, by the medium of the cortex, into fibres; otherwise they would be entirely destitute of perfluent juice, either being obstructed, or else being wounded with perpetual aneurisms.\* If the blood were not opened up it could not be the storehouse and seminary of all things in its body, since, in order that it may put forth anything from itself, it is necessary that it open its bosoms and enclose what it is able to give. This does not come from the serum, for the serum exists for the sake of the blood. To the end that the blood may be thus often compounded and recompounded there is need of daily aliments, of an afflux of chyle, yea, also of a purer food, drawn from the circumfluent air and ether. But why should I recount the several points? The things which confirm are innumerable, nay, they include also the phenomena of the several diseases.

320. *Thus there is a distinct circulation of the red blood; a distinct circulation of the purer blood, that is, of our animal spirits; and a distinct circulation of the purest blood, that is, of the essence of our soul; just as there are distinct vessels, namely, arteries and veins; distinct medullary fibres or nerves; and distinct simple fibres. Thus there are three circulations, as there are three bloods or animal fluids; and there are three fibres or vessels.*

321. *The first circulation, like that fibre which is simple and that blood which is purest, is the most simple, the supreme, inmost, most remote and most perfect of all; the one only circulation which reigns in the rest and over the rest; of which*

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\*Blancard's Medical Dictionary (edition of 1777) speaks of two kinds of aneurism, the true and the false. The *true* consists in a tumor resulting from the rupture of the inner or outer coat of an artery and the consequent dilata-

tion of the other coats; but the *false* consists in a rupture of all the coats, and the consequent escape of the blood. The latter appears to be the aneurism referred to in the text.



can be fitly predicated whatever has been predicated of the simple fibre and of its substances and forms; for it is these same substances and forms that carry on this circle.

322. The second circulation, like that fibre which is medullary and that blood which is purer, follows just after the first circulation, and comes just before the third circulation. Thus it is mediate, and is more simple than the following circulation, superior to it, more internal, more remote and more perfect; but less simple than the preceding circulation, inferior to it, posterior, more external and more imperfect; of which can be fitly predicated all that has been predicated of the medullary or nerve fibre, and all that has been predicated of the purer blood or animal spirit; for it is this same animal spirit that carries on this circle.

323. The third circulation, like the ultimate fibre or the blood vessel, and like the red blood itself, follows just after the second circulation. Thus it is the last of the three circulations, the outmost, postreme, and compound; and it is more imperfect than the two prior circulations, and is the corporeal circulation itself; in which and over which reign the two others; and of which can be fitly predicated all that has been predicated of the artery and vein and of the red blood; for it is this same blood that carries on this circle. Respecting these circulations confer Transaction I, n. 148, 325-344, 359-370.

324. The other humors, which are compounded of the blood, and its purer essences and saline elements, and of the serum, also perform their circulations; for there is no animal humor existent which does not circulate after its own manner. See Transaction I, n. 148. But these circulations are special and particular, and they depend on that of the blood, while the three circulations mentioned above, are the determinants of all things in their kingdom. Wherefore the first is a superior universal circulation, the second an inferior universal, and the third circulation or that of the blood is a general circulation. What the superior, and the inferior universal is, and what the general, see Transaction II, n. 205.

325. As the simple fibre enters into and excites the medullary or nerve fibre, chapter xxii, so the first circulation the

*second. Or, as the first animal essence, which is its soul, enters into and determines the second or middle essence, which is the animal spirit, Transaction I, n. 37, 40, 41, 91, 97, 110, 503, 556, 634, 656, and in the Transaction on the Animal Spirit, so the first circulation the second.*

**326.** *As the compound or medullary fibre enters into and composes the blood vessel, chapter xxii, so the second circulation the third. Or, as the animal spirit enters into and determines the red blood, so the second circulation the third. Thus whatever has been said of fibres and vessels and of their fluids, may fitly be said of their circulations. For the circulation indicates what is the form of the fluxion in fluids and in their fibres or vessels, and what the nature of the form; and also the reverse.*

**327.** *Each circulation is carried on separately; all are also carried on conjointly, that is to say, the first in the second, and the first and second together in the third or blood circulation. This influx of the one into the other is what we call the circle of life. Respecting this circle see our first reflections in Transaction II, n. 168-171. And if this circle be rightly explored, then will be understood the nature of the mutual and reciprocal commerce of soul and body. For the first circulation is that of the soul. The word circulation does indeed involve local motion, and yet the soul is void of extense and motion, n. 289; but because the determination of the soul is along the simple fibres, and determination without fluxion cannot be conceived of, therefore, for the sake of a better understanding, in place of determination, I have used the word circulation, although this word is not altogether adequate except by way of correspondence and by analogy. Confer n. 290. The third circulation is that of the blood, or is the corporeal circulation, n. 323; the middle is that of the animal spirits, by means whereof the soul inflows into the body, and harmony is established between them.*

*(End of Part I.)*



# THE NEW PHILOSOPHY.

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## Editorial Notes

In view of the small response to the offer made by Dr. Boericke to reprint Swedenborg's work, *The Animal Kingdom*, that offer is now withdrawn, or rather it falls automatically. It has been made quite evident that there is but little demand for the work.

The Transactions of the last meeting of the SWEDENBORG SCIENTIFIC ASSOCIATION, which have hitherto been published in our July issues, are this year deferred to the October issue, in order to include Professor Brown's lecture on the *LESSER PRINCIPIA*, which is not yet written out in full. We hope also to include Mr. Brown's valuable diagrams.

The claim is frequently made that Swedenborg and not La Place is the father of the nebular hypothesis; we imagine, however, that Swedenborg himself would hardly have admitted its truth. There are undoubtedly points of contact and resemblance between the doctrine of the *PRINCIPIA* and La Place's hypothesis, but nevertheless the two are so fundamentally opposed that it is a matter of surprise that so much stress is laid on their resemblance and none on their fundamental divergence. As Clissold in his Preface to the *PRINCIPIA* (p. lxxxix) well says: "Swedenborg begins at the centre, La Place at the circumference. Swedenborg traces the process of creation from the centre to the circumference; La Place traces it from the circumference to the centre. According to Swedenborg, the centre created the circumference; according to La Place, the circumference created the centre. On the other hand,

both agree that the planets were formed by a condensation of zones, and hence that planetary matter was originally solar."

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### BOOKS RECEIVED.

THE JOURNAL OF EDUCATION OF THE ACADEMY OF THE NEW CHURCH. No. XIII. Bryn Athyn, Pa. Pp. 55. With the present number the JOURNAL OF EDUCATION commences as a quarterly journal, the official organ of the Academy of the New Church. The number before us is the "catalogue number" and gives full and detailed information respecting the courses in the Academy schools.

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IMMORTALITY ESTABLISHED THROUGH SCIENCE. By JOHN O. YEISER. Pp. 128. National Magazine Association, Omaha, Neb. Price, \$1.00. A speculative wandering in a maze of darkness. We would commend the author to a study of Swedenborg.

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WHAT THE NEW CHURCH STANDS FOR. By the REV. BAMAN N. STONE. New Church Board of Publication, New York. 1912. Pp. 139.

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### THE NEW EDITION OF THE PRINCIPIA.\*

A REVIEW BY THE EDITOR.

#### INCEPTION AND PRELIMINARY WORK.

The new edition of Swedenborg's PRINCIPIA has its inception in the interest and enthusiasm of the SWEDENBORG SCIENTIFIC ASSOCIATION, which first took action in the matter some fourteen years ago.

From its beginning the Association was keenly alive to the necessity of making the philosophical works of Swedenborg

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\*THE PRINCIPIA. . . . THE dell, B. A., and Isaiah Tansley, MINOR PRINCIPIA AND SUMMARY B. A. The Swedenborg Society, OF THE PRINCIPIA. Translated London. 1912. 2 vols. from the Latin by James R. Ren-



accessible to students. In 1898 the committee on a new edition of the *PRINCIPIA*, appointed many years previously by the GENERAL CONVENTION OF THE NEW CHURCH IN AMERICA, resigned, and the General Convention thereupon turned over the whole matter of the *PRINCIPIA* to the SWEDENBORG SCIENTIFIC ASSOCIATION. Later in the same year the Association appointed a committee for the revision of Mr. Clissold's translation of the *PRINCIPIA*, consisting of Dr. Frank Sewall, Editor-in-Chief; Professors C. Riborg Mann and Enoch S. Price; Professor C. Th. Odhner was a member of the committee for the purpose of preparing a bibliographical and historical preface to the revised edition. At the same time an arrangement was made with the LONDON SWEDENBORG SOCIETY by which the latter body was to print and publish the revised work, and the ASSOCIATION to take one-half of the edition; it being understood that the list of subscribers turned over by the GENERAL CONVENTION, corrected and supplemented by new names to be secured by the ASSOCIATION, would be taken in proportional settlement for this half. In connection with this arrangement the ASSOCIATION requested the London Society to appoint two associate editors to co-operate with the American Committee in the revision of the *PRINCIPIA*. The SWEDENBORG SOCIETY thereupon appointed Messrs. Rendell and Tansley.

The committee of the SCIENTIFIC ASSOCIATION completed the revision of volume I. in 1900, and of volume II. in 1901, and in the same years the corrections were sent to Messrs. Rendell and Tansley for criticism and review.

The American revisers had pursued their work in accordance with a definite plan set forth in the report of the committee for 1900, as follows:

A very careful word for word comparison has been made of the Clissold translation with the original Latin. While at first it was thought desirable to make a practically new translation, yet as a result of the critical consideration of the various renderings proposed in the committee, the conclusion was reached that the Clissold translation is, on the whole, so reliable and acceptable as to serve in the main as the standard text, to be subjected to certain important emend

ments here and there, and to have certain omissions restored. A number of uniform changes in the translation of certain important terms to bring them more into accord with present scientific terminology have been agreed upon. Chief among these are the following: "Velocity" for "celerity" . . . "arrangement" for "situation," "entity" for "ens." (*New Phil.*, 1900, p. 56.)

In the committee's report for 1902 we learn that:

"In an interleaved copy of the English edition, Messrs. Tansley & Rendell are entering the American corrections together with their own, coinciding, or varying or additional, and that these notes will be again returned to the American Committee for decision in each point, and then, in England, the final corrections will be entered upon the margin for the use of the printer. . . . The revision by the English members is already well on in the second volume. (*New Phil.*, 1902, p. 127.)

The original arrangement was, however, changed by the English revisers, who announced their new plan in a letter written to the committee in 1903, by Mr. Tansley:

Mr. Rendell and myself have every desire to co-operate with the American editors, and we have accordingly made use of the valuable material which you sent to us. I write, however, to say that we do not consider that we are limited to the notes forwarded to us. . . . We have very carefully examined Mr. Clissold's translation and have come to the conclusion that it will have to be much altered in order to bring the language up to modern requirements. . . . As the work is to be printed here and the Swedenborg Society to be responsible for the publication, as I presume is the case, it will be more convenient and more expeditious to send proofs than to send large masses of notes to be sent back again to us, etc. (*New Phil.*, 1903, p. 92.)

Satisfied perforce with this arrangement the American Committee could only wait. In 1905 they report "that the revision of the English translation of the *PRINCIPIA* by Messrs. Tansley and Rendell is completed, and that the work is ready for the printing; and the arrival of proofs for reading by the American revisers is daily looked for." (*New Phil.*, 1905, p. 253.)

The following year they report:

From the English members of the Committee on the Revision of the *PRINCIPIA*, we learn that the complete revised copy has been some four



months in the hands of the Swedenborg Society ready for the printer, but that the Society is still waiting for certain verifications of names and dates before beginning to print. Proofs will be sent to our committee as soon as printed. (*New Phil.*, 1906, p. 91.)

Some proofs were sent, but the revision as there printed was so wholly different from what had been expected, and so divergent from the revision submitted by the American members of the committee, that the latter felt considerable surprise and even indignation. The work being in print there was no opportunity for discussing and introducing any but superficial changes, and the American committee had perforce nothing whatever to do. The English revisers, presumably with the knowledge of the SWEDENBORG SOCIETY, simply took charge of the whole work.

We have thought it advisable to relate the above particulars in connection with our review of the new edition of the *PRINCIPIA*, in view of the fact that the editors of that work have failed in their Preface to make any reference to them other than may be involved in the acknowledgment that Professor C. R. Mann "read the proofs of the first volume, and gave valuable hints as to the second," and that Dr. Sewall and Professor Enoch Price "also greatly assisted in the work."

#### FOREWORD AND INTRODUCTION.

The delay of publication from 1906 when the revision was completed, to 1912, was due doubtless mainly to the inclusion of the hitherto untranslated *MINOR PRINCIPIA*; but even after this was completed there was still further delay due to the Introduction.

The SWEDENBORG SCIENTIFIC ASSOCIATION had in 1900 formally expressed itself as opposed to interpretative prefaces to Swedenborg's works, and in 1904 it repeated the expression, applying it particularly to the expected edition of the *PRINCIPIA*.

But this was not in agreement with the desires of the London Society, and, when appointing Messrs. Rendell and Tansley to be "associate editors" on the *PRINCIPIA*, the Society had resolved "that a report on the *Principia* be obtained from Prof. S. P. Thompson, Prof. Oliver Lodge, or some other

scientific man . . . the expense connected with it not to exceed ten guineas." (*New Phil.*, 1900, p. 70.) Whether these gentlemen were approached or not we do not know, but in 1900 a report was written for the SOCIETY by Professor Fitzgerald, which "condemns Swedenborg because he bases his system on *a priori* principles." (PRINCIPIA, Introd., p. xxxii.) Nothing further is reported in the matter until 1904 when the Society endeavored to arrange with Prof. Arrhenius for an introduction which should "bring out the points of contact which the PRINCIPIA contains with the science of the present day." (*New Phil.*, 1905, p. 253.) Ultimately, this effort failing, the Society secured a "Foreword" from Professor Sir William F. Barrett, F. R. S., and an Introduction from Mr. Tansley.

Of the Foreword and Introduction little need be said. The former is written by one who—though recently elected president of the SWEDENBORG SOCIETY—has little appreciation of Swedenborg's cosmology, and does not in any sense profess to be a believer in Swedenborg. We are not in the least surprised, therefore, at the mingled tone of patronising approval and supercilious rejection which characterizes the Foreword. What is surprising is that the publishers should have thought it desirable that the PRINCIPIA be introduced to the world by one who appreciates it merely as a milestone in the onward march of science. The motive, we judge, is one that is characteristic of the English, namely, the hope of Swedenborg's receiving a more favorable hearing, if he be introduced by a man of title and authority. But surely Swedenborg is great enough, and well enough known, to stand alone. And in any case more practical results would probably have been obtained by printing the "Foreword" in a pamphlet that could have been widely distributed, rather than including it in an expensive book that few will read.

The Introduction by Mr. Tansley is naturally affirmative; and yet the writer is so evidently anxious that his author shall agree with modern science,—so fearful that unless he does so agree, he is under suspicion,—that he is led to interpret some of Swedenborg's teachings in a way plainly unjustified, and which, we suspect, Mr. Tansley himself would never have



dreamed of if he had not felt under the necessity of making Swedenborg respectably acceptable to that scientific—not New Church—audience, whom he himself is evidently addressing.

Thus, of the first aura of the *PRINCIPIA* he says, "We can see that this corresponds to what is now termed the luminiferous and all pervasive ether." (p. xliii.) We most emphatically say, we cannot "see" this.

Further on, Mr. Tansley observes, "Swedenborg speaks of the galaxy [or milky way] as an axis, but he would seem to mean by this that the milky way is a kind of equatorial ring!" (p. lxxvi.) And his anxiety to exhibit "Swedenborg's anticipations of modern results" to the audience of scientists, who, he seems to anticipate, will read the *PRINCIPIA*, has led him to give as Swedenborg's teaching that "the planets themselves throw off satellites just as the sun had cast off the parent bodies." (p. lxxi.) Yet as to the origin of satellites Swedenborg is diametrically opposed to the modern theory, for he shows that they originate from the sun and contemporaneously with the planets. So well known is this to readers of the *PRINCIPIA* that one would doubt whether Mr. Tansley was one of the latter, were it not for the fact that the teaching is contained in the very volume which he himself has translated. (II. p. 184.)

#### THE EDITORIAL FEATURES.

In the second and revised edition of a translation one would naturally expect a marked improvement over its predecessor, not only in translation but in external details. But the work now before us signally fails to answer that expectation, save only in two respects,—the bibliographical Notices of Authors (prepared by the Rev. James Hyde), and the verification of quotations, and the translation of such of them as had been left untranslated by Mr. Clissold. With these two exceptions the present edition of the *PRINCIPIA* is in every way inferior to the former; nor is this inferiority at all compensated for by the inclusion of the *LESSER PRINCIPIA*,—as we shall presently show.

In the former edition the number of the Part and Chapter was printed as a head line on every page. In the present edi-

tion this is omitted, nor is there anything to take its place, such as the much to be desired consecutive numbering of the paragraphs. How serious a defect this is, we ourselves can testify from sad experience, and it will be obvious, moreover, to any one who, without reference to the Table of Contents, seeks to consult the book at, say, Part II., chapter X. Any such reference can be found in the first edition with great facility.

Another respect in which the present edition is a serious deterioration is the entire omission of italics. Following his usual custom Swedenborg begins his paragraphs with a proposition—marked by italics—which the paragraph elaborates and explains. These italicized passages were afterwards gathered together by the author and formed the SUMMARY OF THE PRINCIPIA. In Clissold's translations all these italics are retained to the great advantage and convenience of the reader. But in the present edition they are omitted; and the omission is a very serious loss to the student, to say nothing of its being a deliberate ignoring of the author's wishes.

#### THE INDEX.

The Index to the present work is a very inferior production. So far from improving on the index of Mr. Clissold the present revisers seem not to have even consulted that far more complete work. A few examples will suffice to illustrate the point,—a point which is further emphasized by the fact that the new index contains no cross-references.

CLISSOLD'S INDEX.	NEW INDEX.
ACTIVE of the Second finite,—12 references.	No entry.
—— of the third finite,—5 references	——, 2 references.
—— of the fourth, fifth, etc.,—12 references.	No entry.
GRAVITY,—10 references.	No entry; but under CENTRE OF GRAVITY are 4 references.
ELECTRICITY,—6 references.	—— 2 references.
FIRE,—half a page.	—— one reference.
SATELLITES,—refers to <i>Planets</i> , where there are three references to Satellites.	No entry, not even under <i>Planets</i> .
SOLAR VORTEX,—32 lines.	—— 2 references.



## THE TRANSLATION.

The title page informs us that this edition has been "translated from the Latin,"—the first volume by the Rev. J. R. Rendell, B. A., and the second by the Rev. Isaiah Tansley, B. A.

Anyone acquainted with the history of the translation will naturally be much surprised at this announcement, and may well ask the question: When does a revision become a new translation? Certainly it does not become such by reason of a multitude of changes; for these may be made,—as seems often to be the fact in the present case,—with little or no reference to the original. But a revision can properly be called a new translation only when the work shows numerous and serious changes introduced by the reviser *as a result of his study of the Latin text*.

Judged by this standard the present work is most emphatically not a new translation. It is true that numberless changes are introduced, but in large part these are mere verbal changes which do not in the least affect the sense; which are made with a view of modernizing Mr. Clissold's language; and which might have been made without any reference to the Latin. In all these changes we have noticed only one case (noted below) of an alteration in Clissold where the latter was at fault as to the sense; while several cases occur where the revisers have continued Mr. Clissold's mistakes, besides introducing numerous ones of their own.

On the other hand, there are whole pages in which Mr. Clissold's translation is practically unaltered, and whole paragraphs in which not a word is changed.

But even supposing, as we must suppose, that the revisers felt themselves justified in claiming the credit of a new translation it would seem to most men that truth, if not gratitude, would impel them to an acknowledgment of indebtedness to Mr. Clissold's work. Yet the only reference made to that work is: "THE PRINCIPIA was first rendered into English by the Rev. Augustus Clissold, M. A., . . . and published by W. Newberry, 6 King Street, Holborn.. It has been out of print for many years"!

But however the two gentlemen responsible for this edition may choose to style their work, we for our part rejoice that it is not a new translation in any real sense of the word. Mr. Clissold was a Latin scholar, and though fault may be found with his occasional pleonisms, there can be no question but that, with few exceptions, his work faithfully reflects the meaning of the Latin. Students of Swedenborg are to be congratulated that the new editors had Clissold as their guide; for, as we shall show presently, when these editors have undertaken to translate without the guidance of a previous translator, they have made the most ignorant and ludicrous blunders. We could have wished in the present case that they had followed Mr. Clissold more closely, or even had left him unaltered.

But of a truth the work now before us is neither a new translation nor a revision,—unless it be a revision backwards. It is little more than a modernization of Clissold's translation. To modernize the language with a view to adapting it to the supposed requirements of the scientific world,—this has been the aim of the “translators,”—not to revise with a view to making the translation a more faithful reflection of the original.

This modernization, moreover, seems to have been governed more by the caprice of the moment than by any guiding principle. We are forced to this unhappy conclusion by the numerous inconsistencies which characterize the work. Let us give a few illustrations:

FIRST ENS (*primum ens*). Without any reason this is changed in i. 54 to “primary beginning” in i. 68 to “first primary” (*sic.*); but usually and even directly following the above changes, it appears as “first entity.”

FIGURE (*figura*) is sometimes retained,, and perhaps more frequently, is changed to “form.” The inconsistencies occur even on the same page. Sometimes it is retained in the PRINCIPIA, and changed to “form” in the corresponding place in the SUMMARY, and *vice versa*.

PERIPHERY (*peripheria*) is generally changed to “circumference,” but in one place where Clissold translates *peripheria* as “circumference” (i. 118) the word is changed to “periphery”!

CORPUSCLES (*corpuscula*) is variously changed to “bodies” (i. 245), “particle” (i. 192), “minute corpuscles” (ii. 219); but in all these cases



the word "corpuscles" is restored in the SUMMARY. In i. 246 it is changed to "minute particles" which in the SUMMARY is varied to "very small corpuscles."

SITUATION (*situs*). Most frequently this is changed to "arrangement," but in many cases (*e. g.*, i. 512, ii. 155) "situation" is restored in the SUMMARY.

CHAOS (*chaos*). The chapter-heading "The Universal Solar and Planetary Chaos" is changed to "The Universal Solar and Planetary Nebular Matter" (ii. 172), but in the SUMMARY the word "chaos" is restored. Nor in the chapter itself is the change to "nebular matter" again adventured; but "chaos" is either retained or else is changed to "chaotic condition" or "chaotic state." Elsewhere (ii. 177) it becomes "chaotic mass." Thus, according to the revisers, Swedenborg writes a chapter on nebular matter in which no mention is made of "nebular matter."

FORCE (*vis*). Frequently retained; but sometimes changed to "energy" and restored in the SUMMARY (*e. g.*, ii. 568); "conjunctive force" (*vis conjunctiva*) is changed in a chapter-heading (i. 434) to "attractive force," but in the chapter itself "conjunctive force" is retained.

PURE AND TOTAL MOTION, retained in i. 61, becomes in the SUMMARY and also elsewhere in the PRINCIPIA "Pure and absolute motion."

The utter capriciousness of the work as shown in the above few illustrations is still more apparent in the following cases (out of a number) where the reviser of the PRINCIPIA has correctly retained Clissold, while the translator of the SUMMARY (often the same person) has changed him.

PRINCIPIA. ( <i>Rendell.</i> )	SUMMARY. ( <i>Tansley.</i> )
Progressive motion (i. 193).	Progression of the parts (ii. 567).
Efficient cause (i. 107).	Sufficient cause (ii. 556).
Interiorly it is pressed by its own active, and exteriorly by the first elementaries (i. 219).	Interiorly it secures pressure from its own active, and exteriorly by ( <i>sic</i> ) the first elementaries (ii. 571).
Gyres and circles (i. 138). ( <i>Tansley.</i> )	Figures and circles (ii. 559).
Light without heat (Clissold and Swedenborg, "light in a cold state") (ii. 219).	Light minute bodies without heat (ii. 601).
This active [of the fourth finite] (ii. 240).	This [fifth] active (ii. 603).

On the other hand, the case is sometimes reversed,—the SUMMARY being correct and the PRINCIPIA wrong. But the citations that have been given sufficiently illustrate the inconsistency which characterizes the revision,—words capriciously changed and then, sometimes in the very next phrase, again restored.

Quite apart from this serious fault, however, this “modernization” of the PRINCIPIA, is in most respects a deterioration from Clissold. The leading changes are not only unnecessary but they ignore and sometimes entirely do away with that exact use of words so characteristic of Swedenborg. We cite a few cases in addition to what have been adduced above:

CLISSOLD.	NEW EDITION.
Degrees and moments.	Successive derivations and parts (i. 54).
Conatus.	“Effort;” “tendency” and in one case (ii. 552) “Effort ( <i>conatus</i> ).”
Circumfluent.	In a state of motion.
Volution.	Movement.
Fluxion.	“Motion” sometimes “fluxion” and in LESSER PRIN. “fluxional movement.”
Fluent point.	“Point in motion,” “moving point.” In the PRINCIPIA Clissold’s “fluent point” is always changed to one of the above; but in translating the MINOR PRINCIPIA, the reviser of Clissold adopts “fluent point” and sometimes “flowing point.”
Yielding surface.	Impressionable surface.

In a few passages Clissold is apparently improved on; but the improvement is so slight and is accompanied with such risk of mistranslations that on examination it turns out to be only an appearance. We refer more particularly to the poetical passages of the PRINCIPIA where Clissold usually becomes a free and periphrastic translator,—*though he rarely if ever loses the meaning*. Here the revisers sometimes simplify his language and bring it nearer to the original. But sometimes—and more often—they merely substitute a shorter para-



phrase for a longer; sometimes and frequently they retain Clissold's paraphrase *in toto*, even where a simple translation would make good English; and sometimes in changing Clissold they have mistranslated and destroyed the sense. It is quite evident that they had but an obscure idea of the real meaning of the Latin. Far better a lengthy paraphrase with the author's meaning preserved than the mixture of improvement, retention and deterioration, with the meaning sometimes perverted, which is offered by the revision.

A single passage taken at random,—wherein, for the purpose of better comparison, we have introduced italics,—will illustrate all the above points

## LITERAL.

Everyone measures his wisdom by the knowledge *and cognition of things which he possesses*. . . .

## CLISSOLD.

Everyone measures the degree of his wisdom by his knowledge of those things which have fallen within his own sphere. . . .

## NEW EDITION.

Everyone measures his wisdom by *his understanding of those things with which he is acquainted*. . . .

Here the reviewer makes a poor substitution for Clissold's paraphrase.

and because he cannot go farther he thinks it impossible to go farther. Therefore he *becomes elated as though he were a man of the highest wisdom*.

and since he can advance no farther, he is apt to imagine that he knows all that can be known; whence he becomes elated with the notion of his possessing the highest attainable wisdom.

and since he can advance no farther, he thinks it is impossible to go beyond this, and *therefore he imagines that he is a very wise man*.

The reviser has substituted a paraphrase for Clissold's verbose but correct translation. The rendition of *sapientissimus* as "a very wise man" is characteristic, for throughout the revision superlatives are toned down in every possible case.

He cannot suppose limits in things of which he is ignorant (*in illis quae ignorat terminos ponere nequit*).

The extent of his ignorance he knows not, because here all is dark before him, and in darkness there are no visible limits to enable him to measure extent.

To the things of which he is ignorant he can place no limit.

Here Mr. Clissold has preserved the general sense, but the reviser sadly blunders. By translating *ponere* "place" instead of "suppose," he makes Swedenborg say that the conceited man sets no limit to his ignorance, *i. e.*, that he admits that his ignorance is boundless,—which

is just what he would not say. In any case it is not what the Latin says.

But if he were to compare those things which he knows with those which he does not know, *how narrow and contracted would he stand within the limits!*

Could he, however, compare that which he knows with that which he does not know, how contracted would appear his knowledge;

If, however, he could compare that which he knows with that which he does not know, *how narrow and contracted would his knowledge appear;*

Here the reviser has supplied an omitted word; otherwise he retains Clissold's paraphrase with a few verbal changes.

And, oblivious of self and with eyes cast down to the ground, how mute with astonishment would he be! and, *unmindful of self, would turn his mind and spread it without bound, into the immensity that is left!* . . .

How oblivious of himself would he be, and how mute with astonishment would he stand while exploring the unknown immensity before him. . . .

With eyes fixed upon the ground, how oblivious of himself would he be, and how mute with astonishment would he stand *while exploring the unknown immensity before him!* . . .

Here Clissold makes two omissions, only one of which is supplied by the reviser. For the rest the latter follows Clissold, and it is difficult to compare him with the original; he does *not* say what Swedenborg says.

The greatest wisdom, therefore, consists in this: That *we may know only that we know so little (ut modo sciamus quod paucissima sciamus).*

In this, therefore, consists our highest wisdom, that we know how small is the extent of our knowledge.

It is, therefore, a mark of the highest wisdom to know *that we merely know and that our knowledge extends to a very few things* (ii. 168).

In changing Clissold's translation, the reviser has again blundered over the Latin.

The above quotation from Clissold must not be taken as characteristic of his style of translation. He indulges in free renditions, for the most part, only in the more flowery passages of the PRINCIPIA; in the rest he is usually more exact and literal. But even where Clissold unduly expatiates, his revisers have rarely improved him. Indeed, as in the case of the citation last made, their work often suggests that they have attempted to revise Mr. Clissold without any consultation of the Latin. Witness the following few cases:



LITERAL.	CLISSOLD.	NEW EDITION.
To conclude.	To form conjectures or conclusions.	To form theories or conclusions (i. 16).
Philosophy with its reasons.	Philosophy with its comparative and proportional reasoning.	Philosophy with its resources of reasoning (i. 16).
Mechanically.	By mechanical order.	In definite order (i. 522).
It does not as yet carry in discord the seeds of things which are not well conjoined ( <i>nec adhuc fert semina rerum non bene junctarum discordia</i> ).	Nor as yet does it comprise within it the seeds of things whose parts have been ill-assorted to each other in consequence of a discordant influence.	It does not yet contain within it the seeds of things <i>and which (sic)</i> are discordantly joined (ii. 198).
As much is hidden from him as lies open before him ( <i>illum latet quantum patet</i> ).	He does not comprehend everything that lies around him.	The whole of what exists is not comprehended within the sphere of his observation.

In our examination we have noted only a few cases where Clissold has given the wrong meaning, and of these only one has been corrected by the revisers, although they have introduced changes in them all. If, in these cases, they examined the Latin, it is manifest proof of their incapacity to act as revisers, to say nothing of their being translators. We give below the cases we have noted, the last being that in which Clissold is correctly revised:

LITERAL.	CLISSOLD.	NEW EDITION. (Rendell.)
This motion <i>in conatus must have a centre</i> and it must have a periphery.	This motion must have its centre in conatus and it must have a periphery.	This motion <i>must have its centre in effort</i> and it must have a periphery (i. 70).

The motion referred to is that of the first point,

everywhere and continually <i>presenting itself as bound to its one only mechanism.</i> ( <i>se unico suo mechanismo addictum ubivis et jugiter sistendi</i> ).	everywhere perpetually observing the same mechanical laws.	everywhere perpetually <i>sustaining itself when given over solely to its own mechanism</i> (i. 98).
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Here Clissold does no violence to the sense. But his reviser is impossible; he is evidently ignorant of the meaning of *se sistendi*, and so makes a guess at it.

That . . . no other force was needed than a certain active centre *which should act*; and that, for the rest (*caeteroquin*) the elementary particles themselves spontaneously *disposed themselves* into a general motion . . . ; and . . . *perpetually continue it*.

That . . . no other force was needed than a certain active centre; and that otherwise the elementary particles themselves would spontaneously dispose themselves into a general motion; . . . and that . . . they would perpetually continue this motion.

No other force was needed than a certain active centre; *otherwise* the elementary particles *would spontaneously dispose themselves* into a general motion . . . ; and . . . they *would perpetually continue* this motion (i. 227).

The reviser, besides failing to supply an omission in Clissold, has also followed him in a mistranslation which makes Swedenborg say the exact opposite of what he intended. In a scholar like Clissold the mistranslation of *caeteroquin*, to which the error is due, may be ascribed to a temporary nodding; but in the case of the reviser it is but another instance of ignorance and incompetence.

## LITERAL.

According to our finite senses we think *the finite to be an intermediate tending from its least to its greatest*. But since *the finite on either side, in respect to the infinite, is nothing*, therefore the intermediate is to be conceived of as being relatively nothing; and thus *its greatest and least are one and the same* (*Secundum sensus finitos putamus finitum esse intermedium, ab ejus minimo tendens ad ejus maximum; sed quia finitum utrinque in respectu ad infinitum est nihil, hinc concipiendum est intermedium respectue ut nihil, et sic ejus maximum et minimum unum idemque*).

## CLISSOLD.

Our finite senses are apt to conceive that in the infinite there is some finite intermediate between the least and the greatest, tending from the least to the greatest; but inasmuch as what is finite is as nothing in respect to what is infinite, we ought to consider the intermediate between them as also respectively nothing; so that, in the infinite the greatest and least ens are one and the same.

## NEW EDITION.

(Tansley.)

According to our finite senses we are apt to conceive that *the finite is intermediate stretching from the least to the greatest*; but because *what is finite is as nothing in respect to what is infinite* the intermediate between them [between what?] must also be regarded as respectively nothing; so that, *in the infinite the greatest and least entity are one and the same* (ii. 151).

Here Mr. Clissold makes his author to speak as obscurely as a Del-



phic oracle; and the reviser alters him just enough to turn obscurity into nonsense. What Swedenborg actually said is clear enough.

The world exists . . . the more perfectly in proportion as it is able better to regard its first (*eo perfectior existit mundus . . . quo melius possit*, etc.

The more perfectly the world exists . . . the more easily may it refer itself to its first principle.

The more perfectly the world exists . . . the better can it regard its primary (ii. 166).

This is the only instance we know of where Clissold transposes *eo . . . quo*; but to the reviser these words, of simplest Latin, seem to offer great difficulties, for in the *Minor Principia* he makes varied and numerous mistranslations in connection with them.

What is the distance of these [poles of the tellurian vortex] from the poles of the earth.

What is the distance between the poles of the earth.

What is the distance of these from the poles of the earth (ii. 59).

The faulty work of translation is ascribable to both ignorance and carelessness, but to the latter alone can we ascribe the revisers' numerous mistakes with regard to omissions. We have noted but six cases of omissions in Clissold, and of these only three are supplied by the revisers. On the other hand, they have introduced quite a number of omissions on their own account. Thus they have "coheres" (ii. 258) for "*almost coheres*;" "first finite" (i. 224) for "*actives of the first finite*;" "variability" (ii. 1) for "change and inconstancy;" "atmospheric fire" (ii. 240) for "*common atmospheric fire*." In ii. 220 they omit the words "light exists," thus leaving a sentence incomplete. A whole proposition is omitted in ii. 585; and in ii. 531, a whole chapter! The latter omission is explained by a footnote which states: "n. 1 which we have omitted, is a transcript from the Preface to the *PRINCIPIA*." The note is characteristic of the slovenly recklessness of this whole edition. For Swedenborg's Preface contains no word even suggestive of the omitted chapter. That chapter is not a transcript at all, as every, even cursory, student of the document would at once know. It is a *first draft* of a very small portion of chapter I. of the *PRINCIPIA*, on the True Philosopher. About two-thirds of it was used in writing out this chapter,—though

greatly expanded and slightly rearranged; but the latter third was not used at all, nor, so far as we know, does anything like it occur in the PRINCIPIA. Why then was it omitted? Even had it been a transcript this would be no reason for its omission; for no information is given as to what portion it is a transcript of. Moreover the whole of the SUMMARY, occupying over sixty-five pages, is professedly nothing but a transcript of the PRINCIPIA'S propositions, yet this is—very justly—not omitted!

There are other criticisms which might be made against this most unfortunate revision of the PRINCIPIA, such, for instance, as the apparent ignorance—and the actual ignoring—of the meaning of Latin moods and tenses; but sufficient has been said to show the faulty nature of the work.

#### THE "MINOR PRINCIPIA."

We turn now to the MINOR PRINCIPIA, the only work included in the present publication in which the translator has had to rely solely on his own knowledge of Latin. And what do we find? Such gross blunders, the exhibition of such ignorance of even elementary Latin, that we are almost led to doubt the evidence of our own eyes. It would be useless to review this work by taking up the points that are ordinarily noticed in reviews of a translation,—*e. g.*, style and the rendition of particular words; for the translation is utterly vitiated, not in one or two places but *in toto*.

The citations which we shall presently make in proof of this charge are but a few of the more than seventy-five serious blunders which we have found on comparing about one-fifth of the work with the original. Doubtless still more would have been noticed had our comparison been more leisurely. Here is involved no question of differences with regard to Swedenborg's philosophy; no conflicting views as to principles of translation; no dispute as to the rendition of words. It is simply a question of the meaning of Latin,—and not of difficult Latin, nor of Latin concerning which there can be any possible difference of interpretation; but of Latin so plain



and simple that any competent scholar could translate it at sight. The failure to translate this Latin correctly is sufficient proof in itself of the utter incompetence of the so-called translator.

LATIN.	LITERAL TRANS.	TANSLEY.
Quod vero reliquas stellas attinet . . . non aliam originem traxisse videntur quam sol vel stella magni nostri vorticis. (Latin Ed., p. 73.)	But as to the rest of the stars . . . they seem to <i>have</i> <i>been drawn from no</i> <i>other origin than that</i> <i>from which the sun</i> <i>or star of our own</i> <i>great vortex was</i> <i>drawn.</i>	But as to the rest of the stars they seem to <i>have originated</i> <i>from the sun or star</i> <i>of our own mighty</i> <i>vortex</i> (ii. 382).

The ignorance of the translator is shown in his translation of *sol vel stella* as if they were accusatives.

We pause here to note that this mistranslation has already served as the basis of a most unjust criticism against Swedenborg. Writing in the NEW CHURCH REVIEW for July, Professor F. Very, after quoting Mr. Tansley's "translation," characterizes it as "a statement which demonstrates that at this time the author had a totally inadequate conception of the magnitude of the stellar universe, and had entirely failed to grasp the idea that our sun is only a minor one lost among the myriads of the starry host." (*N. C. Review*, July, 1913, p. 409.)

SWEDENBORG.	LITERAL TRANS.	TANSLEY.
adeo ut non modo sequantur motum su- perficie . . . in- tra, sed inde sequi- tur, quod omnino se- quantur ejusdem su- perficie motum ad extra (Lat. Ed., p. 77).	so that they not only follow the motion of the surface . . . within, <i>but it fol-</i> <i>lows from this that</i> they wholly follow the motion of the same surface on the outside.	so that they not only follow the motion of the surface . . . within <i>but continue to</i> <i>do so because they</i> wholly follow the motion of the same surface exteriorly (ii. 387-8).

To understand the next citation, it should be known that by "globule" or "globe" Swedenborg means the small central globe gradually formed at the centre of a sphere or particle as a step in the production of a new particle.

quoque major glo- bus eo ovalis magis evadit figura, agit enim materia ambiens violentius in	And the larger the globe the more oval is the resulting figure; for the surrounding matter acts more vio-	The larger globe becomes more oval in form; for the sur- rounding matter drives it somewhat
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superficiem globuli quo illa proprior est ad superficiem ipsam sphaerae; ut si globulus esset tam amplius ut exigua distantia esset inter superficiem sphaerae et superficiem globi, tunc agit motus vel materia ambiens in superficiem globi violenter, *et consequenter ducit secum in eundem motum superficiem globi*; superficies globi secum trahit materiam sui interiorum usque ad centrum sed motus sensim diminuitur (p. 58).

lently upon the surface of the globule the nearer that surface is to the surface of the sphere. So that if the globule were so large that there was only a slight distance between the surface of the sphere and the surface of the globe, then the motion, or the surrounding matter, acts violently upon the surface of the globe, *and consequently draws the surface of the globe into the same motion with itself*. The surface of the globe draws with it its interior matter even to the centre, but the motion gradually diminishes, etc.

forcibly into the surface of the small sphere when that is nearer to the surface itself of the small sphere. So that if the small sphere were so ample as to make the distance between the surface of the small sphere and the surface of the globe insignificant then the motion of the surrounding matter would act violently against the surface of the large sphere. The surface of the large sphere draws its own interior matter with itself as far as the centre; but the motion gradually diminishes, etc. (ii. 363).

According to the published translation the whole of this passage is the merest nonsense. The translator again displays ignorance of the words *quo . . . eo*; but his whole translation is so ridiculous that we have confined italics to showing where he has omitted a sentence. In the following also Swedenborg is made meaningless:

Quod ipsum oculum attinet ibi se meninges extra caput protrahunt, et radiis se quasi exponunt, et muniunt se etiam aliis tunicis. Cum ergo tenuissimae membranae sint pia et durae meninges ad radios in oculo expositae, quid inde aliud profluere potest quam ut in oculi membrana et rete sit sensatio undulationum miniarum (p. 144).

As to the eye itself, there *the meninges [i. e., of the brain] extend themselves* outside the head. and as it were *expose themselves to rays*, and also protect themselves with other tunics. Since then the most delicate membranes,—the meninges of the pia and dura mater,—*are exposed in the eye to rays what else can result but that in the membrane and retina of the eye there is a sensation of the least undulations*.

As to the eye itself, *its structures lie* outside the skull and *are made evident by radiating fibres*, as it were, and protected also by various coverings. Since then the extremely attenuated coverings of the brain—the pia mater and the dura mater—*extend to the radiating fibres in the eye*, the most minute undulations *must be taken up by the membranes and retina of the eye* (ii. 469).



nihil est impedimentum quin punctum tremulans citissime per totam superficiem fluat et indicium praebeat tremulantis fere superficiei (p. 127).

there is no impediment to prevent the tremulating point from flowing most rapidly throughout the whole surface, and presenting the appearance of an almost tremulating surface.

there is nothing to offer any obstruction but the very rapidly vibrating point which runs over the entire surface and indicates that almost the whole of it is in a state of undulation (ii. 449).

To note only one point in the above, the word *quin*, the *pons asinorum* of the schoolboy, is the translator's difficulty; and he solves it by making his author say the exact opposite of what he really said. This is the case also in the next citation:

tales novae particulae formatae non illius expansionis sunt, ac illae quae dein sunt factae (p. 179).

such newly formed particles are not of the same expansion as those which are made later.

such newly formed particles are not subject to expansion, nor those which were subsequently produced (ii. 514).

Volumen particularum elementarium in bullulas quasdam agere tentat quas-cunque particulas, quamvis irregularis formae sint, modo separatae sint et fluidae redditae (p. 190).

A volume of elementary particles endeavors to bring into the form of bullæ all particles whatsoever, even though they be of irregular form, provided only they be separated and rendered fluid.

A volume of elementary particles endeavors to act upon certain small spheres whatever the particles, although they may be irregular in form, provided they are separated and retain their fluency (ii. 527).

This is the title of a chapter, and, as published, it makes meaningless nonsense. In the next citation (and also in several other cases) the translator arrives at strange results by making *constat* followed by ablative (consists of) equivalent to *constat quod* ("it is evident that")

nec impedit materia circumambiens, constat etiam illa subtili materia quae non reagit et repugnat cui-cunque motui dato (p. 127).

nor does the surrounding matter offer impediment, for it also consists of subtle matter which does not react and fight against any given motion.

nor does the surrounding matter offer an impediment, as is also evident from that attenuated matter which does not react and fight against the given motion (ii. 448).

tremulationem appello tantum motum in superficie incussum non vero alium (p. 126).

I apply the term tremulation only to motion impressed on a surface, and to no other.

I designate undulation motion in a struck surface only (ii. 448).

Sed de his non  
prolixè adhuc agi  
meretur, cum in trans-  
cursu modo hæc  
prælibentur (p. 59).

But it is not worth  
while to treat of  
these points at length  
at the present time,  
*since they are put for-  
ward by way of intro-  
duction and in pass-  
ing only.*

But it is not worth  
while to treat of this  
point further; *what  
we have said is suf-  
ficient in a general  
way* (ii. 365).

We can account for this translation only by supposing that the translator, utterly at sea as to the meaning of the Latin, felt obliged to write something.

In the citations that follow we know not whether the mis-translations are due to carelessness or to incompetence, but probably they are due to both. In any case they pervert the meaning.

SWEDENBORG.  
ad calculum hoc sane  
redigi potest (p. 28).

LITERAL TRANS.  
this *can certainly* be  
reduced to calcula-  
tion.

TANSLEY.  
this *cannot at all* be  
reduced to calcula-  
tion (ii. 327).

sed ipsi gyri . . .  
licet velocior est mo-  
tus. non tamen eodem  
tempore possunt exigi  
(p. 119).

But although the  
motion is swifter,  
nevertheless the gyres  
. . . *cannot* be de-  
scribed in the same  
time.

But the gyres . . .  
although the motion  
is swifter, *can* never-  
theless be described  
in the same time (ii.  
438).

ut taceam illas de  
quibus adhuc non ac-  
tum sit (p. 131).

to say nothing of those  
respecting which *we  
have not yet treated.*

to say nothing  
of those which *we have  
hitherto treated* (ii.  
453).

etiam potest sequi (p.  
58).

it *may* also follow.

it *necessarily* follows  
(ii. 363).

hinc verosimile est  
(p. 177).

it is consequently  
*likely.*

it is consequently  
*true* (ii. 511).

non scio an ullum  
elementum . . . tan-  
tam vim . . . habet  
etc. (p. 188).

*I do not know  
whether* any element  
. . . has so great  
a force, etc.

*I do not think* any  
element . . . has  
so great a force, etc.  
(ii. 525).

decupla (p. 189).

increased tenfold.

doubled (ii. 526).

sine motu centri (p.  
130).

without motion of the  
centre.

the motion of the  
centre being station-  
ary (*sic.*) (ii. 452).

*Undulatio* is translated generally "undulation," but sometimes "vibration." On the other hand, *tremulatio* is translated generally "vibration," but sometimes "undulation;" thus in chapter 114 it is "undulation" in the first half of the chapter,



then wavers between "undulation" and "vibration," and finally settles on "vibration." This inconsistency combined with ignorance produces the following contradiction, although there is no contradiction in the original. To appreciate the contradiction the passages in the third column should be read consecutively.

per tremulationem intelligitur motus in superficie particulae, per quem motum superficies tantum moveatur vel tremulat, non vero ipsa particula (p. 126).

by tremulation is meant motion in the surface of a particle, by which motion the surface alone moves or tremulates, but not the particle itself.

*By undulation is meant motion on the surface of a particle by which the surface is simply moved or undulates without the particle itself being moved as a whole (ii. 447).*

undulatio est motus reciprocus particulae, adeo ut particula ipsa cum suo centro moveatur, at tremulatio est motus in superficie particulae, quae fit quiescente centro ejus (p. 149).

undulation is the reciprocal motion of a particle so that the particle itself moves together with its centre; but tremulation is motion in the surface of a particle which goes on while its centre is at rest.

*An undulation is the reciprocal motion of a particle, the particle itself being moved together with its centre; but a vibration is motion in the surface of a particle which takes place without affecting the centre (ii. 476).*

The above comparisons take account only of ignorant and ludicrous blunders in translation, and only of a few of these. They take no account of gross carelessness in copy or proof—we know not which; as, for example, "reach" for "react" (ii. 514), "prepared" for "proposed" (ii. 426), "pertaining in" for "obtaining in" (ii. 367), "considered" for "obtained" (ii. 335), etc. Nor do they take account of merely *poor* translations, of inconsistencies, of omissions. Of the latter we ourselves have noted more than ten ranging from a word or two to complete sentences. But it would be superfluous to point these out, for the present "translation" needs not correction but rejection.

#### THE "ARGUMENTA IN PRINCIPIA."

What has been said about the MINOR PRINCIPIA applies with equal force to the "translation" of the ARGUMENTA, here called "Some points bearing on," etc. Let a single illustration suffice,—being a part of the definition of the first natural point:

## SWEDENBORG.

nihil in illo concipi potest quod in composito, nec quicquam ei tribui potest vi definitionis quod composito, nisi quod sit simplicissimum ejus, merum, purum et primum (p. 197-8).

## LITERAL TRANS.

*nothing can be conceived of as being in it which is in a compound; nor, by virtue of the definition, can anything be attributed to it which is attributed to a compound, except that it is its highest simple, its real, its pure and its first.*

## TANSLEY.

*it cannot be conceived (sic) as composite, nor can it be in any way defined as composite, unless we say that it is simplicity itself, genuine, pure and primary (ii. 532).*

In the ARGUMENTA, however, the "translator" has even less excuse than in the MINOR PRINCIPIA. For while ignorance of Latin never excuses one who assumes to be a translator from that language, it becomes even more inexcusable when there is already a published translation by a competent Latin scholar. But perhaps Mr. Tansley did not know that the ARGUMENTA, translated by Professor R. W. BROWN, was published in the NEW PHILOSOPHY, and afterwards in book form in SCIENTIFIC AND PHILOSOPHIC TREATISES, p. 109-125.

## SUMMARY.

The new edition of the PRINCIPIA—including also the SUMMARY—is inferior in almost every way to the edition which it was expected to revise and improve on. In the matter of external details,—references and differentiation of type,—it is less convenient for reading and reference. By the student who would make an exact study of Swedenborg, it cannot be used at all without caution and reference to the Latin. Still, based as it is on the competent work of Mr. Clissold, despite the revisers' changes, it reflects the original in a general way.

So much cannot be said, however, of the MINOR PRINCIPIA and the ARGUMENTA. These are absolutely unreliable as any guide to Swedenborg's cosmology. Their errors are so numerous and so serious that no caution can guard the English reader against them. His only safety lies in the fact that many of the errors are indicated by the meaningless or nonsensical language with which they are clothed,—but this does not supply the teaching which the errors have perverted.



So far as the ARGUMENTA is concerned, it can be procured in the translation by Professor Brown, already referred to. Unfortunately there is no translation of the MINOR PRINCIPIA except the one we have reviewed; and as for this, the work will have to be done all over again before it can be of any use. And we suggest, in passing, that when it is published in new translation, it receive the title given it by the author, namely, the PRINCIPIA. It could be distinguished from the other work of that name by the addition of the word Posthumous. In any case it is not a *Lesser* PRINCIPIA nor a *Minor* PRINCIPIA, but an *earlier* PRINCIPIA.

#### CONCLUSION.

It is to us a source of extreme regret that we must give wholesale and well-nigh unqualified condemnation to a publication to which students have looked forward for so many years; which was brought out at great expense; and the appearance of which was greeted with such satisfaction. But we have been at considerable pains to compare the works with their originals, and we feel it incumbent upon us to lay the results of our study before the public. Nor is this done with any desire of holding up anyone to contempt or ridicule, though it is impossible to pass such criticisms as we have been obliged to pass without their involving the serious charge of incompetence against those responsible for the present publication, or without feeling just indignation at their assumption of a work for which they are plainly incompetent. But we have written, and written at some length, in the hope that when those concerned see the true nature of their publication they will take steps to remedy the matter, and that, in the meantime, our readers may be guarded against false presentations of Swedenborg's teachings.

In 1907 it fell to the lot of the present writer to review a translation of DICTA PROBANTIA made by the reviser of volume one of the PRINCIPIA, with whom was associated the reviser of volume two, who is also the translator of the MINOR PRINCIPIA. That review was a well deserved condemnation of the

translation as "slovenly," "inconsistent" and "inaccurate,"—in fact, the same criticisms were passed upon it as are now passed upon the *MINOR PRINCIPIA*. (See *New Church Life*, 1907, p. 40.)

The review evidently attracted the attention of the publishers, for at the next ensuing annual meeting of the *LONDON SWEDENBORG SOCIETY* the chairman quoted the criticism that mistakes had been made by the translator "such as would hardly be expected of a school boy," and he expressed the sentiment that a criticism such as this should never be applicable to any publication by the Society. Shortly afterwards the work was withdrawn for much needed revision.

But even while this was being done the preparation of the *PRINCIPIA* was going on, and—in the same hands that had been responsible for the condemned translation! Their work has received no review by a competent scholar; and now with all its glaring blunders it has been allowed to appear under the honored imprint of the *SWEDENBORG SOCIETY*.

That Society which has presented Swedenborg to the world for so many years; which, at great expense and with admirable energy, organized the Swedenborg Congress in order to make the philosopher better known to the scientific world; that same society now presents to the public a work in which Swedenborg is made to speak with a looseness and inexactitude unworthy of a philosopher; to contradict himself; to utter nonsense; and even to declare what is palpably false!

The legitimate fruit of this publication is, in part at least, adverse criticism against Swedenborg; charges such as that made by Professor Very to the effect that Swedenborg taught the origin of the universe from our sun; charges that he wrote obscurely and in words without sense; charges which, while true enough as based on his translator's blunders, are in reality as unjust as they are undeserved. And the only defence that the organizers of the Swedenborg Congress can make against these charges is—the incompetence of their own translators.

Will the London Society continue to extend to this publication the sanction of its approval? Must it devolve upon some other body to publish the *PRINCIPIA* and its related works in a translation in some way worthy of their author?



## PHYSIOLOGICAL PAPERS.

BY LILIAN BEEKMAN.

## THE OFFICES OF NUTRITION.

SWEDENBORG'S LAW OF AN ISOMERISM IN THE EXTERIOR STRUCTURE OF THE CORTICAL GLAND OF THE VOLUNTARY AND INTELLECTUAL.

Swedenborg states that in the organic human form, more especially in the exterior form (the dendritic outgrowth) of the cortical glands of the cerebrum,—the forms themselves are constructed of fibres coiled in a spiral.

These cortical glands are the organic basis of the intermediate mind, that is, of that mind wherein is the voluntary and intellectual, and the outer body whereof is the whole interior or common sensory. It is this plane which is, as it were, rudimentary in infancy, and in which, during the period of growth and reformation, man works together with the Lord, to himself determine the eternal basic form of its life, and therefore of his own life.

Concerning this plane, or this structure in the cortical gland, the statement is definitely made that while the exterior shape thereof may appear the same in one man as in another, the interior form, or the lay, turn or coil of the fibres making that interior form, may, in the case of the one man, all lie in spirals curling from left to right; in the case of the other, they may lie in spirals turning from right to left; and that this turning is an actual one (*A. E.* 1163).

Matters of great import depend upon this. When the coil of the fibres is from left to right, it is an ascending and opening coil; all the play of thought, all the activity of the mind in its series of thoughts or sensations, is then affected by ascending gyres which open communication with that celestial or inmost cortex, of which we shall treat later. But if the coil of the spiral be from right to left, its gyre turns downward and contracts; and all the play of thought will be fixed along lines determined to self and the body.

The interiors of all things of the human mind, and with them the interiors of all things of its spirit, are capable of being turned either downward or upward. They are turned downward when man loves self above all things, and they are turned upward when he loves the Lord above all things. It is an actual turning. . . . The ruling love is what effects the turning (*A. E.* 1163; 1168).

Man's affection of love and his thoughts thence, are changes and variations of the state and form of the organic substances of his mind which are the subjects of his affections and thoughts. With the good these purely organic substances and forms are spirated forward, but with the evil backward; and those that are spirated forward are turned to the Lord and receive influx from Him; but those that are spirated backward are turned to hell and receive influx thence. . . . And because a turning once induced cannot be twisted back, it is evident that as man is when he dies such he remains to eternity (*D. P.* 319).

All fibres and vessels of an infernal human form are inverted (*D. P.* 296).

The fibrils which weave or form the substance and determine the interior connections of the cortical glands,—the common organ of sense-images, imagination and lower thought,—lie in vortex-like circlings, inward and outward, after the fashion of perpetual curving spirals woven together as a garment or basket might be woven; and they are combined to produce or bring into forth-standing actuality, the sensitive forms or vessels which are of the intermediate degree recipient of life.

With the good these spirals turn forward, but with the evil backward. The gyration from right to left is turned downward, thus toward hell; but the gyration from left to right goes upward, thus toward heaven (*D. L. W.* 270).

It is as if each gland as to the interior lay of its fibres was a minute organic turbine wheel. Exteriorly one could distinguish no difference in the shape, yet interiorly one turbine wheel would have its interior vanes and partitions slanting, say from right to left, while the other would have them slanting from left to right. Then, when a like stream was let into the centres of the two wheels, by one wheel the water would be thrown out with a turn to the right, while from the other it would issue with a turn toward the left.

In like fashion is it with the formation of the cortical gland of the cerebrum as it transacts its sensory and voluntary life. During the years of growth, the fibres contexturing these



glands, and all the lines of nutritive infilling and fixing may, in the glands of one man, turn in one direction, and in the glands of his brother in the reverse. Thus "the one may be taken and the other left" (*Matt.* xxiv. 40); the one prepare himself as a vessel reactive to heaven, and the other to hell; and this on the basis of the same parentage, environment, education.

This is the fact and law of the voluntary and intellectual of the cerebrum,—that ultimate plane where man works together with the Lord; the plane in which the individual man through his power of the repetition of images as the voluntary delights in them, has the power of determining his heredity for the eternal life; that is, of determining forever his actual form in respect to scopes of faculties, to powers, planes, states, and to appropriation and intramodification of life. This is the plane which, once well formed and well fixed or infilled by nutritive spheres, is with difficulty reformed, even in this world; and as its condition is at death so it remains, nor can it be changed to all eternity. "As the tree falls, so ever it lies."

The turn of the fibre itself is determined by the heats and loves which kindle the voluntary; by the imagined delights and ideas upon which the mind in the seclusion of the closet fixes its desires and dwells with perpetual repetitions. If the turn of the fibre be downward, and if that turn be not reformed during man's life upon earth, he has, as it were, so far as any realization of them in himself is concerned, forever cut himself off from, and lost, all those powers and greatnesses and delights, all that human fulness, which God willed for him when He gave him, even in the prenatal form, a simple cortex. He has, as it were, lost his soul (*Matt.* xvi. 26). And, in due season, the determination of the fibre one way or the other, in the voluntary and intellectual organism of the cells which are the very voluntary and intellectual form, will, in its turn, affect the whole interior of the body.

Moreover, all the spheres or radio-emanations given off by forms of the one type or the other, are themselves channelled and formed even as the parent structure, and are a basis and centre for the excitation, in the lower natural active atmospheres, of currents and vortices turning likewise either to the right or to the left.

This immense statement of Swedenborg's stood without illustration in the ultimate world of experiment until a few decades ago when the great study of isomeric substances and their facts and powers startled the minds of men with a perception that a world of differences, comparable to the difference between a right-hand turning or a left-hand turning, was to be found in molecules of chemical compounds which had hitherto borne the same name, and between which chemistry had been unable to discriminate. Nor indeed has chemistry pure and simple ever been able to discriminate between them.

It was found that chemical compounds apparently the same but formed under different conditions presented differences of effects which could be accounted for only by the supposition of some differences in the interior arrangement of their atoms,—atoms which in both compounds were alike in number and name. This difference was first made apparent by the different reaction of such substances or compounds to light. For instance, when two salts of the same name but prepared under different conditions were separately dissolved, and a ray of light passed through each solution,—the light, of course, passing through the very molecules of the salt,—in the case of the salt from one source the light did not traverse the solution directly but was turned to the right hand as though the undulation had passed through a conduit coiled in a spiral directed toward the right; while in the case of the complementary salt of the same name, the same chemical composition,—though derived from a different source,—and dissolved in exactly the same way, the entering ray of light would turn in precisely the opposite direction.

Sometimes, as in the case of tartaric acid, three forms were isolated: That which turned the ray of light to the left, as if it ran through a spiral way turning from right to left; that which turned it in the opposite direction as if it passed through a spiral way turning from left to right, and that which allowed it to pass directly through as if by a straight conduit.

These diverse effects were to be rationally accounted for only on the supposition that in the one salt the atoms of its molecule were arranged in a sort of spiral staircase turning from left to right; while in the other the like atoms and of



the same number were arranged in a spiral staircase turning in the reverse direction.

This difference in the reaction of the molecule to the influx of light was found, both in the organic world and in the inorganic, to be accompanied by a difference in physical properties. The dextro-rotary substance would perhaps be a normal food, and the laevo-rotary a great and subtle poison.

Moreover, it was of particular interest that a chemical compound formed by non-organic synthesis, whether in our laboratories or in inorganic nature, would present no evidence of rotation either to right or left, while the same substance if formed in the hidden laboratory of an organic living body would be able to effect the rotation of light.

We quote now from scientific testimony on this subject.

PASTEUR. (*The Asymmetry of naturally occurring organic Compounds.*) The greatest interest in isomerism comes from its introduction of the idea that bodies may be entirely changed in character by a rearrangement of the atoms of its chemical molecules. . . . The existence of molecular asymmetry shows itself by optical rotation (Lecture I, 7).

(Tartaric acid is known now to exist in three forms: 1. The racemic acid through a solution of which the undulatory stream of light passes without rotation or proceeds directly on its way by a straight line. 2. The dextro-acid, in the course of which a solution turns the current of a stream of light passing through it toward the right hand. 3. The laevo-acid, a solution of which turns the course of a stream of light toward the left (Lect. II, 6).

Are the atoms of the dextro-acid arranged in the form of a right-handed spiral? (Pasteur asks; and he continues that in this case, the atoms of the laevo-acid would be arranged in the form of a left-handed spiral, and the racemic acid in the form, as it were, of straight conduits) (I, 7).

When one investigates bodies with regard to their identical parts he soon recognizes they may be divided into two great classes. . . . One, of forms the reflected image of which can be superposed upon the original. With the forms of the other class this cannot be done, although the forms are the same in all their parts, . . . A straight stairway, a cube, the human body, are examples of the first class. A winding stairway, a screw, a hand, an irregular tetrahedron are forms of the second class (II, 1).

Here we meet with the phenomenon that is well calculated to excite much attention, even when it is considered by itself independently of

the whole of the conclusions which come later. All artificial bodies and all minerals have superposable images (that is, the molecules of all artificially formed substances, and of all minerals do not rotate to right or to left; in other words, they have a symmetric arrangement of atoms like a straight staircase). Opposed to these are many organic substances (I might say nearly all if I were to specify only those which play an important role in plant and animal life), all of which are important substances to life, are asymmetric and indeed have the kind of asymmetry in which the image is not superposable with the object. (That is, images which are respectively like a right-hand spiral staircase, or a left-hand spiral staircase.) (II, 3.)

I know of no more thoroughgoing difference than just this between all the substances which are formed under the influence of life, and other substances. (That is, that the former possess the power of rotating the plane of polarization to the right or to the left, while the latter are symmetric.)

The knowledge that ordinary asymmetry is a direct organic principle, and the knowledge of the lack of this property in all bodies of dead nature, permits us to extend and render more exact our assumption in regard to this noteworthy molecular property (II, 5).

Asymetry shows itself as <sup>an</sup> property which has also the power of altering chemical affinity. . . . I hold the existence of an asymmetric force acting at the origin of natural organic compounds as proven; while this force is lacking, or is without interest in our synthetical preparation of the same compound (II, 11). (Translated by Geo. M. Richardson in *The Foundations of Stereo-chemistry*.)

PROF. F. R. JAPP, M. A., LL. D., F. R. S. Pasteur's gift to chemistry is the establishing of the connection between optical activity and molecular asymmetry in organic compounds.

This earlier work of Pasteur's ought to be of interest to physiologists because it furnishes, I am convinced, a reply to the most fundamental questions that physiology can propose to itself; namely, whether the phenomena of life are wholly explicable in terms of chemistry and physics.—in other words, whether they are reducible to problems of the kinetics of atoms; or whether, on the contrary, there are certain residual phenomena inexplicable by such means, pointing to the existence of a directive force which enters upon the scene with life itself and which whilst in no ways violating the laws of the kinetics of atoms,—whilst indeed acting through these laws,—determines the course of their operation within the living organisms.

The latter view is known as vitalism. At one time universally held, although in a cruder form than just stated, it fell later on into disrepute; "vital force," the hypothetical and undefined cause of the special phenomena of life, was relegated to the category of occult qualities; and the problems of physiology were declared to be solely problems of chemistry and physics. Various causes contributed to this result.



In the first place the mere name "vital force" explains nothing; although, of course, one may make this admission without thereby conceding that chemistry and physics explain everything. Secondly, the older vitalists confounded force with energy; their "vital force" was a source of energy; so that their doctrine contradicted the law of the conservation of energy, and became untenable the moment that this law was established. I would point out, however, that the assumption of a purely directive "vital force" such as I have just referred to, using the word "force" in the sense which it bears in modern dynamics, does not *necessarily* involve this contradiction; for a force acting on a moving body at right angles to its path does no work, although it may continuously alter the direction in which the body moves. When, therefore, Prof. J. Burdon Sanderson writes: "The proof of the non-existence of a special 'vital force' lies in the demonstration of the adequacy of the known sources of energy in the organism to account for the actual day by day expenditure of heat and work," he does not consider this special case. The application of the foregoing principle of dynamics to the discussion of problems like the present is, I believe, due to the late Prof. Fleeming Jenkin. A third ground for abandoning the doctrine of a "vital force" was the discovery that numerous organic compounds for the production of which the living organism was supposed to be necessary could be synthesized by laboratory methods from inorganic material. It is the validity of some of the conclusions drawn from the latter fact that I wish especially to consider.

Recent years have, however, witnessed a significant revival of the doctrine of vitalism among the physiologists of the younger generation.

It is not my intention to offer any opinion on the various arguments which physiologists of the neo-vitalistic school have put forward in support of their views, these arguments and the facts on which they are based lie entirely outside my province. I shall confine myself to a single class of chemical facts rendered accessible by Pasteur's researches on optically active compounds, and, considering these facts in the light of our present view regarding the constitution of organic compounds, I shall endeavor to show that living matter is constantly performing a certain geometrical feat which dead matter, unless indeed it happens to belong to a particular class of products of the living organism and to be thus ultimately referable to living matter, is incapable,—not even conceivably capable—of performing. My argument being based on geometrical and dynamical considerations, will have the advantage over the physiological argument, of immeasurably greater simplicity; so that at all events, any fallacy into which I may unwittingly fall will be the more rapidly detected.

In order to make clear the bearing of the results of stereo-chemical research on this physiological problem, it will be necessary to give a brief sketch of the stereo-chemistry of optically active organic com-

pounds, as founded by Pasteur and as further developed by later investigators.

Substances are said to be optically active when they produce rotation of the plane of polarization of a ray of polarized light which passes through them. The rotation may be either to the right or to the left according to the nature of the substance; in the former case the substance is said to be dextro-rotatory; in the latter laevo-rotatory. The effect is as if the ray had been forced through a twisted medium—a medium with a right-handed or a left-handed twist,—and had itself received a twist in the process; and the amount of the rotation will depend upon the degree of “twist” in the medium (that is, on the rotatory power of substance) and upon the thickness of the stratum of substance through which the ray passes; just as the angle through which a bullet turns in passing from the breech to the muzzle of a rifle will depend on the degree of twist in the rifling and the length of the barrel. If the bullet had passed through the barrel in the opposite direction the rotation would still have been in the same sense; since a right-handed (or left-handed) twist or helix remains the same from whichever end it is viewed, in whichever direction it is traversed. This also applies to optically active substances: if the polarized ray passes through the substance in the opposite direction, the rotation still occurs in the same sense as before. This characteristic sharply distinguishes the rotation due to optically active substances, from that produced from the magnetic field, the latter rotation being reversed on reversing the direction of the polarized ray.

Optically active substances may be divided into two classes. Some, like quartz, sodium chlorate, and benzil, produce rotation only when in the crystallized state; the dissolved (or fused) substances are inactive. Others, like oil of turpentine, camphor and sugar, are optically active when in a liquid state or in solution. In the former case the molecules of the substance have no twisted structure, but they unite to form crystals having such a structure. As Pasteur expressed it, we may build up a spiral staircase,—an asymmetric figure,—from symmetric bricks; when the staircase is again resolved into its compound bricks; the asymmetry disappears. . . . In the case of compounds which are optically inactive in the liquid state, the twisted structure must be predicated of the molecules themselves; that is, there must be a twisted arrangement of the atoms which formed these molecules\*

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\*Only the living organism with its asymmetric tissues, or the asymmetric products of the living organism, or the living intelligence with its conception of asymmetry can produce this result. Only asymmetry can beget

asymmetry. Pasteur suggested that the formation of chemical compounds in the magnetic field, or under the influence of circularly polarized light, would furnish a means of solving the problem. Vant' Hoff also thinks



(Presidential Address, delivered before the Section on Chemistry of the British Association, 1898. *Report*, pp. 813-815).

The phenomenon of isomerism, stated broadly, is, that molecular structures chemically of identical constitution, give practical evidence of a different pattern of interior arrangement of composition. This evidence consists in the power of the molecule to rotate the plane of a ray of light passed through its structures to the right hand or to the left hand. It is as if the interior structure rotated the stream of influx.

This difference of interior pattern thus divined, is threefold for substances chemically identical. Tartaric acid is an instance. There is a racemic or neutral acid which does not deviate or turn the influx of a ray of light. There is a dextro-rotatory acid. There is a laevo-rotatory acid. All these three are chemically identical. The racemic form of the compound is found whenever nature has composed the given substance in the inorganic world of the mineral kingdom; or when we have artificially synthetized it in our chemical laboratory. The rotary forms of a given chemical compound are produced whenever it has been synthetized by processes of organic growth, assimilation and activity in the laboratory of living bodies.

This difference of interior structure evidenced by differences of action upon the inflowing light is as if all the passages and channels in the dextro molecule curved in right-hand spirals, while in the laevo molecule, (apparently the same), all the openings and channels of its internal structures curved in left-handed spirals. Thus the molecules turn the influx of light to the right hand or to the left.

Now this difference of interior structure is found to be ac-

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the latter method feasible. As regards magnetism, Pasteur's suggestion was undoubtedly based on a misconception; the magnetic field has not an asymmetric structure; it is merely polar since the rotation which it produces in the plane of polarization of a ray of light changes signs in the direction of the field. As regards circularly polarized light, I must con-

fess to having doubts as to whether it can be regarded as an asymmetric phenomenon. The motion of the ether about the axis of the ray is circular not spiral; and it is only by considering the difference of phase from point to point along the ray that the idea of a spiral can be evolved from it (*Ibid*, p. 826).

accompanied by other differences of physical property and of action. In many cases the dextro form is a useful food, or at least innocuous, and the laevo form is markedly deleterious. Again, the one may be a normal and laudable secretion, and the other a deadly poison, and this although they are chemically identical. Moreover, that there is co-existence in the universe of forms chemically and often exteriorly and obviously identical, but actually, in their interior structure and the lay and form of it, as reversed as east and west, is not a rare fact, or an occasional fact, but is as common as the reality of organic structure itself. For instance, the most deadly serpent poisons that are known, are isometric forms of laudable albumenoids, their chemical formulas being identical. Moreover, powerful and feverish evil emotions of the animus are capable of producing an almost instantaneous isomeric change in the secretions. Fear or anger or despair in the imaginative mind of the mother will produce such isomeric change in the secreted milk that it will act as a deadly poison upon the tender and recipient organism of her nursing babe. The deadly effect of the bite of poisoned or angered living creatures is due to this fact,—the fevered activity of the animus producing isomeric change in the saliva (*Fibre*, 540).

These facts, well known, are covered by Swedenborg's law, that "Whatever takes place in the animus takes place in the inmost of the blood, and in the inmost of every humor derived from the blood; consequently in the saliva" (*An. King*. 71). The vital propagative power of lymph thus effective is derived from the fact, which Swedenborg notes, that every secretion of the body, that is, the secretion of every cell in brain or body, is in little measure, an offspring or seed carrying in itself some effort toward propagating a power of its own type and form, and this from hour to hour (*A. K.* 183, note 1).

That a great field of tremendous suggestion and practical import is here opened is easily seen; yet the mere facts of this isomerism were unsuspected by the world's research but a few decades ago.

This brief and rough summary of the findings of the new department of research is illustrative when we wish to make



a clear mental image of the great facts of the isomeric forms possible to the grey cells of the brain which Swedenborg gives in his doctrine of the growth of organic form, and primarily of the growth of the organic forms or units of the human brain which are the common organic basis of the sensory and imaginative life with the heats and desires and loves thereof. They are also, as I need hardly remind the reader, the organic basis of the natural memory where all things of the intellectual and sensitive experience and of the voluntary action, reflective and recollective, of this plane of the mind are in each man individuated and made permanent.

Nothing that is known of chemical isomerism, of the dextro and laevo rotary forms of molecules chemically, and of their power to turn the influx of light in contrary directions, can be more peremptory and unqualified than what Swedenborg asserts for the grey cells of the brain where the exterior memory, sense experiences and habitual imaginations and recollections are infixed. Moreover, according to Swedenborg's statement, whatever the isomerism of this plane of the natural memory or animus, the same will be the isomerism derived into all the corresponding structural forms of the body, into all its secretions, and all the perspirable and emanating or effluvial spheres of both brain and body. In one man, as already said, the coil of the spirals weaving the form of the grey cells of the cerebrum may turn all from left to right; in his twin brother standing beside him they may all turn in the reverse way. Moreover, in the case of the former man the ray of light from the heavenly spheres, the Spiritual Sun, will enter in its true gyre, and affecting, stimulating, illuminating, delighting, will add its infilling force of light to the fair order of the organic form itself and to all the action of that form. But in the case of his brother the influx of life and light from the Spiritual Sun, as it passes through the reverse curves of the recipient channels, is actually turned into a reverse curve.

This accounts for the fact given in the Memorable Relations, that truths themselves,—the influx of heavenly life and light,—will become perverted even to their opposite if they enter into an organism the lay and curve of whose fibres has been framed to perverting curves of falsity. It also will ac-

count for the statement in the SPIRITUAL DIARY that spiritual truths cannot be enrooted in the plane of the natural mind, if that mind have been already formed and fixed along the lines of falsity concerning the causes, laws and facts of the interior plane of nature; else the spiritual truths themselves would be perverted. Before spiritual truths can enter there must be either a breaking up of these forms of the natural mind and their reforming; or, with a younger generation, the great natural truths of that plane must be given in early education.

The science or wisdom of the present day is such that it cannot serve as a plane for spiritual and still less for celestial truths; but it is like an ultimate heaven which perverts truths let down thither from heaven into the contrary; for at this day, whatever is taught by the sciences respecting the natural causes of phenomena, . . . is full of false hypotheses wherein not one single truth appears to the sight,—nay, by their means the way is closed so that the thoughts cannot extend beyond grossest nature; and therefore things spiritual and celestial are considered as of no account. . . . The spiritual can hardly be operative unless this false and mendacious plane be entirely broken up and destroyed, or be turned into a plane of natural truths (*S. D.* 249-250).

#### ISOMERISM IN NUTRITIVE SPHERES.

Moreover, the law that the sphere of radio-emanant or effluvial particles given off by these diverse forces will present the peculiarities of the parent form in subtler, more patent and less destructible form, accounts for a fact frequently noted in the Memorable Relations, namely, that if there be gathered together a great crowd of men, the organic basis of whose sensual and exterior minds has been formed in such a manner that they pervert, more or less into the opposite, any truth let down to them, it will be found that in the very vicinity about them the air and ether are so infilled with the effluvial spheres given off by these perverse brain-forms, that if a ray of light be let down into the general atmosphere of the room where they are gathered, it is, as it were, perverted, darkened, extinguished.

Other things notably follow:

FIRST. These isomeric spheres thus given off by every organic form,—chiefly and leadingly by the human and by every



plane thereof, mind, brain and body,—and floating in the interstices between the bullæ of the aerial elementary and of the active atmospheres generally, afford the great world-stores of the aerial and etherial nutritive chyle. Hence come the volatile salts or nutritives, the oils, the spirits, infinitesimal fragmentary particles which make the volumes of the ether or auras circumambient about our earth thick with nutritive spheres; so that the interstices between the bullæ of the active atmospheres become quickly infilled with such spheres of effluvial and emanant organic remains.

This being true, we can see how it is that, from the same surrounding etherial volume, from volatile stores in which chemical analysis can detect no differences, and the presence of which chemical test cannot perhaps even estimate, the blood of one man may appropriate to itself spheres whose every inner curve and reactive channel inclines one way, while the blood of his neighbor may feed itself upon nutritive spheres which interiorly are formed to the very reverse order; nor could it be told from exteriors that such a difference existed; and we can see the actual possibility of a statement given in DIVINE WISDOM:

With everyone the blood of the heart . . . is nourished by (1) volatile elements and (2), odors from the air; but yet wholly differently with the good than with the evil. . . . With men in the world the blood is nourished, by means of the air, with similar substances as being homogeneous. The human blood in inmosts is spiritual, and in outmosts corporeal. Wherefore they who are spiritual nourish it from such things in nature as correspond with things spiritual, but they who are merely natural nourish it from such things in nature as correspond with things natural. Hence the dissimilitude of the blood in men is as great and is such in quality as is the dissimilitude of love (*Div. Wis. X, 6*).

SECOND. The growing, developing organic structure of the brain-cells, the turn of whose fibres is from left to right, cannot be nourished, nor can its fibres be infilled or fixed by spheres or atmospheric food, the interior curves and channels of whose constitution is from right to left and *vice versa*. This holds also for every substance of the body.

This great truth has been registered even in the general tra-

dition of savage races; it underlies their custom, after victorious battle, of devouring the heart's flesh of their most courageous and worthy enemies, while carefully avoiding to taste the heart of a trembling coward, lest the hearts in their own bodies, fed on coward's flesh, become thereby weakened and cowardly.

To come nearer, many a growing mind in some special department of thought and will awaits in some curve of its advance toward firm thought and originating activity, until the spheres of congenial minds thinking and loving like things shall come, as it were, to furnish the needed mental nutriment,—the actual infilling and infixing spheres without which no idea, no thought, no intention can come to strength, clearness, permanence, or can possess a firm perceptive basis.

This giving forth of spheres is something of lasting responsibility; for the gross structure of an individual body can with comparative ease be resolved into its elements and thus be wholly destroyed, disassociated, decayed. We call this Death. But not so easily is this to be done with the effluvial particles or spheres that have been given forth by that form; nor do they concern that form alone. For these spheres, in emulation of the sphere of the Proceeding Divine, are given off into the universe to be the substances of other created forms. They add themselves to the store of atmospheric chyle or subtle nutriment, and, after the man, the animal, the plant, the chemical compound, long has perished as integral working form, the sphere it gave off in some past hour or day may still stay in the universal laboratory awaiting its hour to enter an organic form with all its stamp and structure embodying its whole conatus and potency, to be actualized, and, as it were, to come to resurrection in that new created form as the same or a correspondent use for good or for evil. Every particle of these spheres, emulating the conatus of substantial love in its flowing force and return from and to the Divine Esse, has the conatus to circle again toward the very quality of the activity of love and wisdom, or of evil and falsity from the conjunct activity of which it was framed as the offspring and outgo. Hence its powers, its services, its conatus and its possibilities for damage or for good, if ever it is gathered and set together with other particles in an organic frame,—powers



which wait, to which it surely inclines, and toward which it subtly presses.

EFFLUVIAL SPHERES AT THE TIME OF THE ADVENT. THE SECOND PROCEEDING.

We can see what was the condition of these finer nutritive planes available for organic growth, at the time of the coming of the Lord. In one aspect this is what is meant when it is said that at the time of our Lord's coming "not even with a single man was there any natural good from a spiritual origin" (*Ath. Creed*, 49); for good and nutritive spheres act one cause.

On this account also it is said, that certain provinces of the lower heavens had to be infilled by evil spheres and spirits, since good were lacking (*A. C.* 6914, 8054, 6858); that is, certain places and provinces of the organic man necessary to complete human organisms had to be infilled by evil nutritive spheres in the lack of good; for wherever nutritive or effluvial spheres go, there go the spirits which make those particular spheres their atmospheres. However, when we tremble over the age-long accumulations of these evil spheres in the enviroing atmospheres,—recalling how many generations of evil men have lived,—we must remember that it was partly for this cause also that our Lord came and took upon Himself the human sensual and corporeal body from which ultimate and effluvial spheres go forth (*Ath. Creed*, 49).

The nature of the Divine Proceeding before the Lord's Advent is described by circles and by degrees, by heavens and by the interiors of man. . . . Wherefore, there is reception when in each degree there are correspondents and, as it were, transmitters; but when in the ultimate degree there was no longer reception of the Divine,—as was the case in the church with the Jews,—then the Divine Proceeding could not be extended thither. Wherefore He took on a human from which might go forth a Divine Proceeding which can be in ultimates also, and thus can preserve the heavens and save the human race. Hence is the omnipresence of His Human in the Holy Supper. . . .

For the Divine Proceeding is such that in things greatest and least it is Man. . . . For all things were so created that affection which is of good . . . may clothe itself with the human form in the several degrees from first to last. Hence it is that angels are human forms. . . . This arcanum is, as yet, unknown in the world. That there is such a disposition in the several degrees, namely, that affection clothes

itself with a body, and this from the Divine Proceeding, is because what proceeds from the Divine, proceeds from each and everything of His Body both interior and exterior. Hence it is that the Divine Proceeding is the Lord in the heavens, and is called the Holy Spirit. Hence it is evident what His omnipresence is. Because affection and love puts on that human form in every heaven or in every degree, it follows that the human which is put on is Divine Truth, and that they are in the Divine Proceeding and are truly men, who are in love and hence in truth. . . .

*The Cause of the Lord's Advent.* Because strength is in ultimates, and thus in the material body (*Ath. Creed*, 177-179).

The universe has been formed that "affection might clothe itself" with a body, chiefly the human body, and this from the Divine Proceeding or atmosphere clothing itself with what is human in the successive degrees thereof from first to last.

As no form thus woven of the proceeding Divine alone,—that is, of the auras and of the omnipresent fibre given of them,—is as yet fixed or organic upon any plane until it has been infilled by spheres,—radio-emanations given off by the organized individuals of the plane below,—it is to be seen that the purpose of creation would be frustrated unless these radio-emanant spheres which form the etherial chyle could be furnished in sufficient abundance and of such a nature as to be adequate to the infilling of the true human form recipient of the Divine Life, and in love reciprocating thereto. Wherefore the Lord Himself took on the ultimate human form from which a proceeding Divine sphere could go forth in ultimates. Thus the Lord came because strength is in those ultimates, and their spheres of consort type and quality are necessary to furnish the infilling particles, by which infilling alone, any orderly basis, organic containant and body of the spiritual heavens can be rendered fixed and permanent.

Thus firmness is in those ultimates, and from the human body, or corporeal and sensual ultimate, this proceeding sphere of which we have spoken,—this effluvial sphere which infills the Divine Proceeding as atmosphere,—can go forth in fullness. Thence is the omnipresence of the Lord in the Holy Supper (*Ath. Cr.* 177); for this sphere is gathered up and collated therein. Thus our Lord, from Whom as Supreme and



Prime Individual or One went forth from the beginning of creation the Divine Proceeding framed into the four active atmospheres, Himself came upon earth to take upon Him the ultimate effect of the world,—Manhood and a Human Shape, the sensual and the corporeal body,—that now, in time, from every part of this His ultimate body, interior and exterior, such an effluvial sphere might go forth as a Second Proceeding,—pure, perfect,—produced and renewed immediately from Himself. Thus He made Himself the Divine Proceeding, as in firsts and from firsts, so also now in lasts and from lasts. The Divine Proceeding of the atmospheres went forth from Him alone as the first of creation from before the beginning of time; and from Him also, in fulness of human history and time and need, went forth that second, that ultimate proceeding, that radio-emanation of effluvial spheres, providing for all creation's stores of infilling particles, orderly, perfect, such as are necessary to render orderly spiritual forms organic.

This sphere it is,—this Second Proceeding in time, the "Secondary Essence" spoken of in the work on MARRIAGE (n. 51; see Index 2, s. v. Influx),—which is sacredly collated in the sacramental bread to feed the soul and mind and heart of the believer. Although in truth the daily bread of our tables may, through our own inner priestly states of love, be thus blessed of our Lord to be as veritably sacramental in our partaking thereof.

Thus God Himself, the Infinite Father, in the person of the Logos, the Son from eternity, Jehovah with us "took on Him the ultimate effect of the world, or Manhood and its shape, that thus the Infinite might be in and with the finite. . . . Through Him is the nexus between the first finite and the last, and between these and God" (*Infinite*, I, xiv, 5).

From this ultimate natural human shape, with its sensual and corporeal form, there also goes forth an effluvial sphere, of every degree, infilling the atmospheres; that from His ultimate and "from each and every thing of His body, interior and exterior" (*Ath. Cr.* 178, 26), might proceed the spheres of infilling particles necessary to organize and infix truly human forms. Thus He made Himself the Divine Proceeding as in firsts always, so now also in lasts,—in reactives and passives of

human organization, and in their proceeding or effluvial spheres. Thus both proceedings now went forth from Him as Man; and mankind and the heavens were not dependent for the second proceeding upon what had been provided by the human race, contemporary and ancestral (*Ath. Cr.* 119).

OFFICE OF EFFLUVIAL EMANATIONS IN THE RISE OF  
ANIMALCULÆ.

From all things in heaven, in hell, and upon earth,—all things and all people, and the whole human frame, interiorly and exteriorly,—a sphere is poured forth, an effluvial sphere, an actual emanation of the finest particles of the parent form itself.

Not even the smallest particle exists which has not its own sphere around it, and conforming parts constituting the common sphere (*Spir. Diary*, 1846).

Everyone in heaven and everyone in hell is beset round about by a sphere consisting of substances resolved and separated from their bodies (*D. L. W.* 292).

A sphere pours forth, not only from angels and spirits, but also from all and single things which appear in that world. . . . It is a universal, both in things heavenly and in things dead, that each is beset round about by the like of that which is within it; and that this is continually exhaled from it (*Ibid.* 293).

All things in the world both animate and inanimate, pour forth from themselves a sphere which is sometimes perceived at a great distance. (Illustrated by the keen scent of dogs, odors of gardens, earths, minerals). (*A. E.* 889).

There is not a single object in the three kingdoms of nature which does not give out an odor which is nothing else than a sort of smoke consisting of minutest substances separated from the various matters (3 *Documents*, 769),—*i. e.*, of infinitesimal particles the same as those which compose the parent mass. Thus gold is surrounded by a sphere of the primitive physical beginnings of gold, etc., etc. (*T. C. R.* 499).

Spheres are of different quality according as is the different quality of the material or physical substance from which they emanate (*S. D.* 3817).

In nature, spheres are represented (produced) only by means of activities (of substances or forms) which form spheres like to themselves, and produce wonderful effects the causes of which can be known only by means of a knowledge of spheres as formed of activity. For they form a kind of universe and their qualities are according to the qualities of the form which gave off the sphere.

In the animal body, these spheres are represented by the incon-



spicuous spheres around men. . . . But in the spiritual world the nature of the extension of spheres is confirmed by the communication of minds and of the affections of one with another to a great distance (*S. D.* 976-978).

The science of spheres is vast (*Ibid.* 982).

Man and his sphere make one (*Ibid.* 931).

Every man actually consists only of such things as are in the earth and from the earth in the atmospheres. Those things which are in the atmospheres from the earth man sucks in through the lungs and through the pores of the whole body (*i. e.*, through the skin) (*T. C. R.* 470).

In the air and in the ether there are floods of particles which straightway serve for composing those things which regard ulterior texture. There are the perpetual material beginnings from which all composition is possible (*I. Ad.* 1457).

On the effluvia from the earth and from the exhalation of vapors from vegetables by which the atmospheres are impregnated, and from which worms (*i. e.*, insects and the forms of animalculæ) are procreated, see *T. C. R.* 470, 499; *Ath. Cr.* 26.

These references, together with the former sections of the present paper will perhaps convey a fuller idea of the formation, the nature, the powers of that sort of atmospheric and ethereal chyle which is the immediate supply drawn upon for the organic composition of the finer degrees of nervous and mental life, as well as for all organic compositions arising *de novo*. It can be seen that forms in past historic ages which have now ceased to be, have yet not ceased to be serviceable to the world's life. For by the spheres which they then gave off they are still furnishing a usable quota to the common store of ethereal chyle. So long as any spheres last they are always ready to lend themselves,—joining together by fine polarities with homogeneous spheres,—to produce the beginnings and entire primitives of organized forms here. It is this plane of the elemental or atmospheric world, thick with organic effluvial particles, that experiment of later years has partly discovered and misnamed the world of "germs." This is the world and plane where, as the *ADVERSARIA* notes, "are the perpetual material beginnings from which all composition is possible" (*I. Ad.* 1457). This is the world by whose substances the formative spirit of the Lord clothes itself over with the finer degrees of human form and organization as with successive garments and embodying (*Ath. Cr.* 178).

It is by means of this world of effluvial spheres that the hells also, or the activities of evil minded men in the hells, are able to create evil protozoic forms upon earth; for evil things upon earth were not created by God.

The things in hell are not created by God; nor are they created by Him in the natural world where similar things exist; for all things created by God are good. On the earth they were created at the same time that hell was created, and this exists from men who by averting themselves from God became devils and satans (3 *Doc.* 759).

Evil beasts and noxious insects were not created from the beginning but they arose with hell in stagnant pools, marshes, stinking and fetid waters, and wherever there are cadaverous, stercoraceous and urinous effluvia with which the malignant loves of infernal societies communicate. . . . Moreover, in every spiritual, (*i. e.*, in spiritual planes of organism) there is a plastic force wherever homogeneous exhalations in nature are at hand; and there is also a propagative force (*A. E.* 1201).

This world of the delicate spheres,—of the floating etherial chyle, where exists vast store of isomeric emanations,—is that into which the hells can send their evil glance abroad. By the glance of their eye, they transfer their interiors, as it were, outside themselves. For spiritual power, whether of heaven or of hell, is to will to transfer one's interiors to another. This actualizes itself by the glance of the eye producing undulations of the surrounding ether medium which correspond to every activity of the spiritual organic form,—undulations which are given out by organic minds. If the stream of these undulations can find homogeneous spheres and emanations, or "material beginnings" the minute canals of which reproduce their own curves of motion, then such spheres can be gathered by the subtly flowing evil activities, almost as beads might be gathered on a string, and can actually be ordained into simple organic reactive forms of evil type. It is in this way that from evil activities of minds which are inhabitants of hell, the evil forms actually moving upon earth have been created,—evil animals and evil and noxious microbes, and other animalculae. Wherever the secretions present an evil isomerism, wherever disease or perverted tissue-cells give out their spheres, wherever fermenting and non-digesting food exists, wherever there are decaying substances sodden and warm,



—there these primitive animalcule evil forms will begin to appear just on the limit of the invisible; and in each will be the power of growth, of division, of multiplication.

Since about the earth the hells exist as well as the heavens, or the evil life as well as the heavenly; and since the radiant power going forth from organized human forms on all its planes, and crossing and recrossing everywhere throughout the atmosphere and ether spheres, therefore, wherever conditions and effluvial spheres are homogeneous, there actual composition of physical form takes place (*A. E.* 1201).

The normal and beautiful aspect of this verity,—this actuality,—is presented in the growth and the perfection, the reformation and regeneration of minds and bodies and bloods. The sad aspect of it is evident in the formation of infesting and evil forms and states of life.

EFFLUVIAL SPHERES, THE ATMOSPHERES AND STIMULANTS OF SPIRITS, WHEREBY THEY ENTER INTO THE BLOOD.

Evil spirits and evil men love all evil structures, and the life of such spirits and of the hells, like the life of the heavens, must close in some more ultimate organic structure. Moreover, this is more imperative for the hells than for the heavens. The currents of the Divine Proceeding in the celestial and spiritual plane, are along lines of truth intolerable to the hells, and in order that evil spirits may get the stimulant reaction or coaction of ultimates they are driven to adjoin themselves to spheres going forth from evil structures. Upon the more ultimate degrees they can find no base or place in the Divine Human; for the Divine Human comes as the touch, the pressure, the presence of Divine Order itself in human form.

Since evil spirits must be adjoined to evil structures and spheres in order for their own stimulant reaction, or for the coaction of ultimates, therefore they must always seek consonant ultimates, or those of like isomerism with the curve of their own falsities of evil. That is, they must seek as ultimates brain-cells and body-cells formed in perverse gyres; for these are their delights. On the sphere of effluvial particles given off by such cells they ride to their own power and pleasure.

For "these are their very atmospheres in which they live" (*S. D.* 3817). Indeed spirits of all sorts, good as well as bad, flock thus to the spheres given off by men; so that in this way they surround the man in the natural world thick as a cloud, clinging to every particle of his sphere according to the quality thereof; and the man seems, "as it were, a solid point" in a dense cloud of gathered spirits (*S. D.* 2087).

Nor are evil spirits and the hells confined to the sphere of a human form for their own ultimate. Decaying stuff, fermenting food, and warm fermented sodden states anywhere,—these also are their consonant and stimulant ultimates. In all festering and ugly matters the infernal genii have their ultimate foothold of operation in the world of actual effect; and in connection with such matter they have their joy.

Falses and evils of every kind correspond to unclean and filthy things in the natural world. . . . Hence it is that the domiciles of those who are in the hells . . . appear like pits and sepulchres; and, if you will believe, such genii and spirits dwell in the sepulchres, latrines, and marshes which are in our world, although they themselves know it not (*A. E.* 659; see also 1057).

Especially do these evil genii love to attach themselves to the particles composing the spheres or emanations of festering and ugly sodden decay and waste matter. For by the evil beating of their heart, and the breath of their evil endeavor they are able to fan a little vortex circulation in and through the pores and canals of such perverted spheres. And by means of such floating spheres they can assail and perchance enter a human body, on the tide of evil spheres "which give rise to contagious diseases and so communicate the pest and poison of their nature" (*1 E. A. K.* 55). Thus they can, as it were, infest the Grand Man and enter themselves where happy and orderly spirits should be.

When man appropriates evil to himself he procures to himself the sphere of that evil, which sphere is that to which spirits from hell who are in a sphere of like evil adjoin themselves; for like is conjoined to like (*A. C.* 6206).

Spirits in the love of ruling correspond to things that vitiate the animal spirit; they are like poisons which induce cold and torpor on the



nerves and fibres which cause diseases of the most gross and fatal character (*A. C.* 4227; *S. D.* 1812; see also *Apoc. Rev.* 678).

For this reason it is that the hells pant for the creation of spheres of unwholesome and poisonous particles which, infesting the human blood, shall excite the disordered emotions of the animus and poison its lower springs of desire and impulse; that thus evil instincts may arise and be stimulated, evil acts be excited, evil thoughts and imaginations and falsities breed their inhuman generation and be fixed forever.

For it is stated that when the completing circulation of the animal spirit, through the grey cells of the cerebrum, bears with it effluvial particles; or when, by the corporeal fibres, effluvial particles are sipped from the chyle of the ether, then as the animal spirit carrying these effluvia passes through the centre of the grey cell, such salts or spheres as it still carries with it powerfully affect the sensitive cell from its inmost ground.

Not always for evil are these offices of the nutritive particles. While evil foods and substances conveyed into the blood can serve here as a foothold for the infestation of evil, and can give to evil spirits power and their sense of delight, yet, on the other hand, the daily use of the good food by which we live, is a use not to ourselves only but to the good angels and spirits who are with us. Hence it is that the heavens pant, as it were, for the existence of created things upon earth able to send out spheres which shall excite the animus of man to good affections, since in that plane of the mind they have their own last reactive basis of life. For only in forms ultimated upon earth where passives bound active forces and are rounded into an integral recipient—reactive—can such spheres be prepared and go forth.

Very astounding is something that Swedenborg observes. He says that when nutritive substances—foods—are taken into the human blood, the angels associated with that individual human being receive their food also (*S. D.* 3566). That is, they receive their perception and ideas of good and truth; and, what is wonderful, as is the quality of the food that the man takes, so is the quality of the thoughts and ideas of those

angels; and as the food is varied in kind, so are varied the ideas of good and truth which the associate angels come into.

When man is being fed by food the angels with him are in the idea concerning good and truth, and, what is wonderful, with a difference according to the kinds of food (*A. C.* 5915; see also *S. D.* 3566).

This astonishing statement may serve as our link of connection and illustration when we read that God leads the creatures of the animal world and affects their brain to ideas and images involving ends and acts which are emulous of rational ones, by means of variously altered and incited states of their blood. This instinctive action is produced by the stimulance of sphere-substances acting according to the quality of their forms upon the interior of the grey cells of the brain (*1 E. A. K.* 90; *2 E. A. K.* 347).

This makes a link of connection and clue to the statements given in the early literature that the passions of the animal mind vary according to variations of the states of the blood (*1 E. A. K.* 7); and this not alone as concerns the various species of animals, but as concerns the states of the animal life or animus of man. For every change and emotion of the blood is accompanied by a simultaneous change of desire thence arising in the animus; although that mind, from previously formed habit of acting along lines of truth and right, may as it were, resist and stiffen itself against the stimulant and prick of desires thus entering.

NUTRITIVE FOODS AND EFFLUVIAL SPHERES, AND POISONOUS ONES.

IMPORTANCE OF PURITY IN THE BLOOD.

In respect to nutrition and to the causes of disease we have Swedenborg's statement:

The means by which we live in the body are also the same as those by which we die; so that the causes of corporeal life are also the causes of diseases and likewise of death. For we live upon aliments taken from earth and air and ether, but the quantity of these aliments wrongly distributed as to quality is the veriest cause of diseases. That the causes of corporeal life are also the causes of diseases and death, is the very nature of nature,—namely, that opposites and contraries should be, in potency, within her several causes and her several subjects (*Fibre* 387; see also 381½).



Of the sources or grades of wholesome aliment with which the blood must be furnished, there are four:

1. "Common food" for the stomach and alimentary canal, from which they may select nourishment and prepare it for the blood.
2. "Atmospheric aliment" for the venous blood in the lungs.
3. "Subtle etherial aliment" conveyed through the sipping mouths of the skin.
4. "Moreover, from every pore, vesicle, and gland, aliment must be provided which has been repeatedly secreted" (*I E. A. K.* 199).

Foods of the fourth class are the mass of lymphs, secretions, and humors—"salivas" Swedenborg terms them,—already prepared from the blood as vital correspondents of the previous states and changes of the mind;\* for "whatever takes place in the animus takes place in the inmost of the blood and in the inmost of every humor derived from the blood (*A. K.* 71). Especially is this change quick, active and living in the lymphoid secretions, since the animal spirit,—the "inmost of the red blood,"—runs free in the lymph, as the red blood corpuscles run in their serum (*Brain* 70). For of the three essences or bloods of the human form,—spirituous fluid, animal spirit, and red blood,—"the highest imparts being, the power of acting and life to the lower; and this imparts the same in like manner to the lowest (*Brain* 83; *I E. A. K.* 312).

There are also four alimentary sources of disease, poisoning and death in the red blood:

1. Food hard and of unserviceable quality; direct gross poisons from the substance of individuals of the mineral, vegetable, or animal kingdom. These, being in disorderly reaction cannot subserve good uses of nutrition; and yet they penetrate the vessels and fibres (*Fibre* 541, 381-382).
2. Floating effluvial salts, urinous and sulphurous particles of the plane of the air, which give rise to contagious diseases, and "so communicate the pest and poison of their nature, as to vitiate the blood, and injure, badly construct, or disunite that compages of its parts which is formed by the orderly coalition of its minute particles" (*I E. A. K.* 55). "Such poisons,—sharp pointed,—wound, tear, and disrupt the constituent globules of the blood in the gyre of its circulation;

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\*Thus the blood must, as it were, feed also upon the results of its past states and the states of the mind.

likewise they render it cold and agglutinated, impeding both its resolution and its composition" (*Fibre* 541, 383-384). "There are also compound poisons which are at first innocuous, but as soon as they resolve from their mass they become very subtle poisons, and thus everywhere infest the blood-stream" (*Fibre* 541).

3. "The insensible Sanctorian perspiration by whose means aliments are drawn not from the air, as in the former case, but from the ether; and they are led not immediately to the veins or red blood, but toward the corticle brain where they are insinuated into the purer blood which is for the integration of the animal spirits" (*Fibre* 385).

4. Poisons of the humors and secretions, which arise from fevered states in the animus and the blood,—lymph and saliva poisons, as with the bite of an angry man, the poison of the viper, and the virus of a mad dog. All evil affections of the blood, as in diseases or in diseased states, which make the secretions,—the derived vital fluids or salivas,—media of contagion (*Fibre* 386; *A. K.* 71). "Of these it is permitted to augur that they are minute poisonous globules of foam or saliva, like little eggs, endued with a prickly tunic in which lies a mixture of poisons. If these oviform vesicles are forced into the flesh by a bite they remain whole for some time; nor are they dissolved and mingled with the blood except by heat and in process of time; and then they make terrible destruction, acting either one after the other in succession, or else in numbers simultaneously" (*Fibre* 542).

Of all the types of poisonous infestation the fourth is by far the worst, not only in its own vital seed-like subtle character, and its carriage of a mixture of all grades of poisons ready for successive hatching, and capable of living latent till favorable contingencies warm it to unfolding; but also in that it breaks into and enters the blood-stream as by a wound and violence. Nor do the absorbent vessels and the various orderly guards and selecting agencies of the body have an opportunity to take it or refuse, according as the soul recognizes in it a correspondent of the passing state of the animus, its needs, demands, appetencies, and what it is, for good or for ill. For "every change and emotion of the animus demands a different quality of blood" (*Brain* 639).

The determinators of the animus are affections which flow in upon it from two ways,—from the macrocosmic or outer world and from the microcosmic world or the body itself.

From the macrocosmic world through the senses it secures



sympathetically the impress of sense-images upon the outside of its units, the cortical glands. As the substances of these glands grow from birth to death, all their sense-images are simultaneously stored in their structures. Habit lies in each of their growing curves firmly. Thus physiological conversion of their downward or world-directed gyre to upward circling path cannot be instantaneous, and so neither can theological conversion be instantaneous. In this cortical substance are imagination and inner sight, memory and self-consciousness of its own variations and motions. All this class of affections, impressed immediately or reproduced and held by choice and self-determined effort, belong to the kingdom of the lungs, of sense-image, idea, thought, perceived and defined form, the spiritual kingdom (*Soul* 340, 350, 95-97, 106-109, 427).

The other way from which the cortical gland receives affections is from the microcosmic world. These affections are the affections of the body, reaching by way of the blood, and its excitant substances. These affections are received as the red blood unit parts and divides, and its component forms or unit particles pass, as purer blood,—carrying a load of adjoined spheres,—into the cortical glands or nervous units of the cerebrum (*Ibid*).

This affection, this change, is an affair of the kingdom of the heart, of the blood, of substance, of touch, the celestial kingdom, the kingdom of desires, moods, states, temperaments, impulses.

The cortical gland is an inner eye; it sees images, imaginations, thoughts. But as we say of the eye that it is distempered, so here, the temper or distemper of the resolved red blood running through the heart of the gland over into the nervous fibres, gives the temper or distemper of the cortical gland as an organ of sense, imagination and thought.

Moreover, as we shall note more fully later, something astonishing may happen when a change in the quality of the blood and the desire thence arising coincides with the objective sense-image or the train of thought. For then there takes place something like a marriage of the two kingdoms. And

the effect of that conjugal union has power to penetrate even to the rational mind and to determine the will without a previous selection or intuition of judging causes (*Brain* 640k). This is celestial reality. The mind grows, forms, delights, even as it thinks, wills and images.

That which works for good may work also for evil. Evil substances given off by forms shaped and acting and reacting to disorder, by poisonous substances, bases to the hells, may coincide with evil imaginations and falsity. Then there is an infernal marriage. For hell has its kingdoms as the heavens have. Hell has its kingdom of the heart, the diseased blood, the fevered lymph, and the poisoned salts and spheres to which the hells of the genii cling, and by which they enter the human blood to affect the desires and impulses of the animus, and to cloud all the thought. It has also its Satan kingdom, its kingdom of the lungs, of evil sense-image, selfish imagination and false thought. And each kingdom desires the other,—urges the preparation of a way for its complimentary power that thus man may be overthrown.

Moreover the prick of the sharp pointed poisons and heterogeneous matters may be so keen that the glands contract and move convulsively, like the eye to a prick. Then the mind bodied in that gland will feel the movement, as it were, a true sense-image from without. Hence delirium, hence mania (*Soul* 427.)

Thus defile the blood and the desires of the animus are defiled; according to every change in the quality of the blood, the state or temperament of the cortical gland also changes. Some salts, some poisons, passing with the resolved blood into the bed of the glands of the brain, persistently excite certain classes of imaginative images (*Aphrodisiacs*).

In the meantime, this care is most incumbent upon us,—to guard both the integrity of the blood, and the integrity and purity and truth of the images of the common sensory, (natural mind, animal mind, animus), that there may be a sound mind in a sound body (*Soul* 428).

(*To be continued.*)



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## TRANSACTIONS

OF THE

### THE SIXTEENTH ANNUAL MEETING

OF THE

### SWEDENBORG SCIENTIFIC ASSOCIATION.

The Sixteenth Annual Meeting of the SWEDENBORG SCIENTIFIC ASSOCIATION was held in the Parkway Building, in the City of Philadelphia, on May 15, 1913, Dr. Frank Sewall presiding.

1. The **Minutes** of the Fifteenth Annual Meeting were approved as printed in the NEW PHILOSOPHY for July, 1912.

2. The Chair appointed Mr. E. F. Stroh and the Rev. E. E. Iungerich a **Committee on the Roll**. The Committee reported that twenty-five members and thirty visitors were present.

3. The following **statistical report** of the membership of the Association, from the time of its organization until 1913, was presented:

Membership 1900	01	02	03	04	05	06	07	08	09	10	11	12	13
New ....	91	31	25	19	8	5	12	48	4	15	4	6	44
Resigned ...	1	..	..	12	6	6	8	8	11	2	9	9	2
Lapsed .....	..	..	..	7	18	4	3	4	6	..	12	10	2
Died .....	4	..	5	3	3	..	3	3	1	3	3	4	..
Net .....	54	140	171	189	185	174	170	169	202	188	198	178	180 220

Of the 44 new members who have been added during the past year, 33 joined the Association as the result of the circular letter and address, distributed some time ago to over 3,000 individual addresses, and about 500 copies of which were sent to the ministers of the GENERAL CONVENTION and the GENERAL CHURCH, with a letter asking their co-operation in distributing them. The results seem a little discouraging,

but we shall probably have small returns from the circular for some months to come. Not a single subscription can be traced to the advertisements in the New Church periodicals,—New Church Messenger, New Church Life, New Church Review, and New Church Quarterly. If 90 per cent. of these new members renew their membership next year, the expense of the circular and address will be met.

#### NEW MEMBERS, MAY, 1912, TO MAY, 1913.

Miss R. E. Sullivan, New York.  
 Miss Alice E. Grant, Bryn Athyn, Pa.  
 Dr. E. K. Richardson, Toronto, Can.  
 Rev. Gilbert H. Smith, Chicago.  
 Mrs. E. F. Robinson, Bryn Athyn, Pa.  
 Mr. A. E. Nelson, Glenview, Ill.  
 Mr. Geo. H. Quermann, Kansas City, Mo.  
 Mr. Carl Hj. Gustafson, Rockford, Ill.  
 Mrs. Annie M. Walker, Bryn Athyn, Pa.  
 Mr. Wilfred H. Howard, Bryn Athyn, Pa.  
 Mr. John F. White, Australia.  
 Mrs. Katharine Benade, Bryn Athyn, Pa.  
 Miss E. W. Potts, Bryn Athyn, Pa.  
 Miss Mary A. S. Scott, Jonesboro, Ill.  
 Mr. F. P. Bayler, Centerview, Mo.  
 Dr. C. A. Swenson, Minneapolis.  
 Dr. Anna C. Grigsby, Concordia, Kan.  
 Mr. L. D. Howes, New York.  
 Dr. Joseph C. Guernsey, Philadelphia.  
 Mr. B. A. Whittemore, Boston, Mass.  
 Rev. Baman N. Stone, Fryeburg, Maine.  
 Mr. Joachin Fritz, Miami, Fla.  
 Dr. J. Perry Seward, New York.  
 Dr. Wm. R. Powel, Philadelphia.  
 Mr. Geo. C. Sims, Des Moines, Ia.  
 Mr. W. B. Murray, Bridgewater, Mass.  
 Miss Eleanor A. Warrell, St. John, N. B.  
 Mr. Frederick Jacoby, St. Louis.  
 Mr. Arthur C. Eckert, St. Louis.  
 Mr. John H. Yeager, St. Louis.  
 Mr. John V. Horr, E. Cleveland.  
 Mr. Oscar A. Bergstrom, Denver.  
 Mr. Peter Ahlberg, Bryn Athyn, Pa.  
 Mr. Alfred Bergsten, Arpen, Wis.  
 Mr. J. A. Haggstrom, Alsask, Sask., Can.  
 Mr. W. A. Williams, Swansea, Wales.  
 Madame Alma von Gedda, Sweden.



Mr. Paul Vosburg, Philadelphia.  
Mr. John Bain, Phoenix, Ala.  
Mr. W. E. Parker, New York.  
Mrs. J. E. Lyon, Medford, Mass.  
Rev. R. J. Tilson, London, Eng.  
Mr. Harry D. Hutton, Washington, D. C.  
Dr. Henry Clay Ruhl, New York City.

4. The **Board of Directors** reported that two formal meetings had been held during the year and in addition several informal meetings. At a meeting on May 16, 1912, the following officers were elected: *Vice-President*, Dr. F. A. Boericke; *Secretary*, Prof. Reginald W. Brown; *Treasurer*, Emil F. Stroh; *Editor of New Philosophy*, Prof. Alfred Acton. At the same meeting it was agreed that the Annual Meeting in 1913 be held in Boston at the time of the General Convention; but it was found, later, that this was not feasible. It was also agreed that the Editor of the New Philosophy, in collaboration with the Treasurer, should draft a circular with a view to arousing more general interest in the work of the Scientific Association.

5. The **Treasurer** presented an annual financial statement. (See p. 123.)

6. In connection with the financial statement the Treasurer reported an increase in receipts of \$114.16 over the previous year, and an increase in expenditures of \$13.80, but the expense, April, 1913, issue of NEW PHILOSOPHY is not included in this statement. A bank balance of \$194.09 was reported, as compared with \$172.75 last year; and a total of \$113.50 in delinquent dues.

7. On motion, the Treasurer's statement was received and the Chair instructed to appoint a Committee of Two Auditors. The Chair appointed Rev. C. E. Doering and Dr. F. A. Boericke.

8. The **Editor of the New Philosophy** reported:

During the past year, dating from June 30, 1912, the NEW PHILOSOPHY has issued four numbers, averaging 43 pages each. This includes thirty pages of the Transactions of the Association.

The work on the SENSES has been completed, and is now printed, in an edition of 500 copies, all except a few odd pages, which are held in

type to be included in a sheet with the index. The latter is now being prepared by the Rev. E. S. Price.

The work on the FIBRE is completed, as to the whole of Part I., and as to almost two-thirds of the entire work. The marked progress of this translation during the year is due to the policy adopted of presenting two large installments of the Doctrine of Forms, so as to present that important doctrine in the form of two brochures.

Although not strictly within the scope of the present report, mention might be made of the fact that since the last meeting of the Association the firm of Boericke & Tafel, of Philadelphia, has published a new edition of Swedenborg's work on Generation, translated by the present writer. The edition is one of 500 copies and has been stereotyped. The work has been favorably received by medical reviewers.

**9. The Committee on Swedenborg's MSS. reported :**

The members of the committee have examined all but three of the MSS., which were copied in Sweden. But since there seems no necessity for hurry, as there is no present prospect of printing, it has been thought best to defer making a report until the whole of the material has been examined.

**10. A Report and Communication from Mr. Alfred H. Stroh was read. (See p. 123.)**

**11. Mr. Acton asked the privilege of making a statement in regard to what Mr. Stroh says in his communication about the translation of the WORSHIP AND LOVE OF GOD. Mr. Stroh had not stated the facts of the case quite correctly. Those facts were: Some time ago, in connection with a class he (the speaker) had been conducting, he had found it necessary to prepare a transcript and translation of Part III. of the WORSHIP AND LOVE OF GOD. Mr. Chandler, of the Rotch Trustees, having heard of this translation, requested the use of it for inclusion in the proposed new edition of that work. Before complying with this request the speaker had, however, communicated with Mr. Stroh, but he had had no intention of editing the work, as Mr. Stroh seems to have supposed, nor indeed of doing more than sending to Mr. Chandler his translation of Part III. Subsequently he sent the translation as requested, and there his connection with the work ceased.**

**12. The Chair congratulated the Association on the prospect of the final publication of the WORSHIP AND LOVE OF GOD.**



13. A Communication from Henry Clay Ruhl, M. D., was read, expressing opposition to printing Swedenborg's Works, and papers interpreting those works in the same publication. He feared that this policy would tend to stamp the approval of the New Church upon the interpretations of individuals, and not leave students of Swedenborg's works in freedom.

14. President Sewall delivered the Annual Address on "Is the Universe Self Centered or God-Centered?" (See p. 125.)

15. The following gentlemen were elected as the officers of the Association for the coming year: As President, Dr. Frank Sewall, and as Directors Dr. F. A. Boericke, Mr. Horace P. Chandler, Prof. Alfred Acton, Mr. E. F. Stroh, Mr. B. A. Whittemore, Prof. Reginald W. Brown.

16. Professor Reginald W. Brown presented an extempore abstract of a paper giving "A General Comparison of Swedenborg's Posthumous or '**Lesser Principia**' with the Published PRINCIPIA." (See p. 136.) Prof. Brown's remarks were illustrated by a series of Charts and Tables prepared for the occasion.

In the discussion of this paper Prof. E. E. Iungerich presented a correlation of the particles of the posthumous and published Principias based on structures instead of upon uses, as in Mr. Brown's paper. These remarks have been written out by Mr. Iungerich and are printed on p. 173.

Mr. Acton expressed great appreciation of the lecture by Prof. Brown. It seemed to him that future study would serve to establish a real harmony between the two Principias, though it was quite clear that this harmony was not now apparent. But an essential requirement before studying the harmony between the two treatises was a thorough knowledge of the teaching of each. The teaching of the published PRINCIPIA was fairly well understood by students of Swedenborg's cosmology, but the doctrine of the earlier work was almost unknown. Our first duty was to master this doctrine,—to know what the earlier Principia teaches, before comparing it with the later; the lecture given by Prof. Brown, with the illuminating charts, which he had prepared, was a notable contribution to this knowledge, for which our thanks and appreciation were due to the lecturer.

17. A Paper by Mr. Geo. W. Worcester, entitled "The Correlation of Swedenborg's Philosophy and Theology" was, in the absence of the writer, read by Mr. Acton.

18. On motion, it was unanimously Resolved, that this Association express its appreciation of the valuable and scholarly translation of the work ON GENERATION, by the Rev. Alfred Acton, and of the generosity of Dr. Felix A. Boericke in defraying the expenses of its publication.

19. Mr. Acton called attention to the fact that Dr. Boericke had also offered to publish a new edition of the ANIMAL KINGDOM, but that the response to this offer had, so far, not been sufficient to warrant undertaking the work.

20. On motion, it was agreed that a paper by Mr. Wilfred Howard "On Charles' Law in Its Relation to Swedenborg's Bullular Hypothesis," be printed as part of the Transactions of the present meeting. (See p. 187.)

21. The Auditing Committee reported that it had examined the Treasurer's Accounts and found the Financial Statement correct.

22. The meeting adjourned at 5:45 p. m.

REGINALD W. BROWN,  
*Secretary.*

#### OFFICERS OF THE ASSOCIATION.

At a meeting of the Board of Directors, held after the adjournment of the Annual Meeting of the Association, the following officers were elected: Vice-President, Dr. Felix A. Boericke; Secretary, Prof. Reginald W. Brown; Treasurer, Mr. E. F. Stroh; Editor of New Philosophy, Prof. Alfred Acton.

REGINALD W. BROWN,  
*Secretary.*



## TREASURER'S REPORT.

May 14, 1913.

## RECEIPTS.

Balance as per previous report .....		\$172.75
Fees, subscriptions and contributions .....	\$374.35	
Sale of publications, net .....	6.67	\$381.02
		<hr/>
		\$553.77

## EXPENDITURES.

New Philosophy, July, 1912-January, 1913. Printing, paper, etc. ....	\$200.70	
Printing, addressing and mailing the President's address and circular—3,500 copies .....	94.00	
General Expenses, as per cash book .....	64.99	
		<hr/>
		\$359.69

Balance .....	\$194.08
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The above balance includes amounts carried on the following accounts:

Royal Academy publications .....	\$10.00
Royal Academy publications, plates .....	2.00
Worship and Love of God .....	11.60
	<hr/>
	\$23.60

Audited and found correct May 15, 1913.

C. E. DOERING,  
F. A. BOERICKE,  
*Auditors.*

## REPORT AND COMMUNICATION BY MR. STROH.

Since my last communication to the Association, (see *The New Philosophy*, July, 1912, and *The Swedenborg Archives*, Part I., Stockholm, 1912), I have forwarded to the Rev. Alfred Acton all materials connected with the text and revised translation of the *Worship and Love of God*, Parts I. to III., suggesting that since I am so pressed with my duties here, he see the remainder of the new edition through the press, especially as he has been engaged upon a study of this remarkable work and has made a translation of the Third Part. There still remain to be forwarded a few copies of short treatises by Swedenborg, promised by me to the Association.

The work in Sweden has greatly expanded during the past few

years, especially on account of the steps taken by a meeting of representatives of New Church printing societies at the International Swedenborg Congress, London, July, 1910, which led to a great increase in the amount of matter phototyped *per annum*, a work which requires most careful planning and supervision. In this connection various scientific and theological MSS. of Swedenborg taken apart over forty years ago for the photolithographing have had to be rebound before arrangements could be perfected to take apart new manuscripts.

The editing of Vols. IV. and V. of *Opera Quaedam de Rebus Naturalibus* is in progress. As these volumes will contain a great number of Swedenborg's unpublished short papers the editing is one of particular difficulty.

During the past year a great deal of attention has been devoted to a general investigation and survey of Swedenborg's MSS. and Printed Texts, and of Miscellaneous Swedenborgiana, in order that the whole question of editorial plans and operations may be solved satisfactorily. The results are most interesting, greatly extending our view of Swedenborgiana in general and in particular, and I am now engaged in treating, bibliographically, in a preliminary manner: 1) materials *by* Swedenborg, and 2) materials *concerning* Swedenborg, dating from his own times. In this laborious task I have not only had, since 1902, the assistance and advice of numerous librarians and other scholars in Sweden and abroad, but have also received most valuable help for ten years from Miss Greta Ekelöf in the investigation of Swedenborg's works, and from Miss Cyriel Lj. Odhner during the past year in the investigation of miscellaneous documents. I propose to edit the *Chronological List of Works and Printed Texts by Emanuel Swedenborg* as a separate work, and, subsequently, with the combined assistance of Miss Ekelöf and Miss Odhner, to issue the unabridged *Chronological List of Swedenborgiana*, including references to materials both by and concerning Swedenborg, in the *Appendix* to Vol. I. of the edition of the Royal Swedish Academy of Sciences, after the removal of the Swedenborg Deposit to the new Library Building, at Frescate, near Stockholm, in 1914. Finally, if possible, the numerous new and old documents, which throw so much light on the life and works of Swedenborg, will be published in *The Swedenborg Archives*. This will lay the foundations for a new and exceedingly thorough study of Swedenborg's mental development and literary progress.

The proposals submitted by me to the printing societies of the New Church with regard to the stereotyping of all texts of Swedenborg in a uniform size and style, with a view to a final complete edition *Opera Omnia Emanuelis Swedenborgii* have been the subject of considerable discussion and correspondence during the past year, and I was especially encouraged by the endorsement given to these proposals last year by the Association and by the Academy of the New Church. But



as some of the parties interested desire one course, and others another course, nothing final has been arrived at, but I hope, in the near future, to explain in detail to the several boards and committees the great advantages which would be won by the adoption of these plans and by united action. The practical thing to do is to deposit sufficient capital in the Swedenborg Fund of the Royal Swedish Academy of Sciences to ensure the final appearance of the proposed *Opera Omnia* and the publication of supplementary material, and also for the honoring of Swedenborg's memory by the erection of his statue at Stockholm and in other suitable ways.

Wishing the Association every success in its important uses.

ALFRED H. STROH.

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## IS THE UNIVERSE SELF-CENTERED OR GOD-CENTERED?

AN EXAMINATION OF THE SYSTEMS OF EUCKEN AND BERGSON

BY FRANK SEWALL, M. A., D. D.

The research, both of science and philosophy, at the present day, seems to be centered upon the subject of life—its origin and its nature. Running through the various theories proposed, there appears to be a common conception of life as a flow—a *flux*. The questions of efflux, a flow *from*; or of influx involving a flow *into* matter from something above; or of afflux—a flowing *toward* something; and what that something is,—these are all for the time quite overlooked in the interest centered upon the *flux* itself;—life a flow; consciousness a flow; all Being a flow.

It is an interesting coincidence that this doctrine of the flux should be the leading principle in the two philosophic systems that most widely occupy the thinking world to-day—those of EUCKEN and BERGSON.

While science, conscious of its limitations, contents itself with studying the processes, or the *flow* of life in nature, these philosophers would seem, at least, to desire to penetrate higher, and to arrive at the nature of life itself or of that which flows.

The question that especially interests us in the present discussion is—as to the origin and nature of the life as so conceived: in other words, in its center and source. Is it God-derived or self derived? Is it an influx or flow from the Di-

vine Love and Wisdom, as a Spiritual Sun or Life-center, into nature and into man? or is it a product of nature itself evolving both man and his God?

EUCKEN.

It would seem, indeed, at first glance, as if both these philosophers had found the world centered in something above nature and above self. Both find our world, our individual life, encompassed in a universal flow of something quite distinct from gross or inert matter. Eucken calls it the Spirit, or an "activity and Power encompassing and transcending the world;" a life that we discern "different from the life of the senses" and that we perceive as a "whole," "whose products are Truths, Goodness, Beauty," which rise into a "realm of inwardness."

This life, says Eucken, is "not a creation of man alone," since "it must come *to* him from the universe." So it is the universe seeking or creating its centre rather than the centre, the universe. It must, says Eucken, "form a new stage of reality into which man, who first belongs to nature, is raised in the progress of his life."

This same seeming separation of the natural and the spiritual degrees or orders,—followed by their commingling and their reduction to a common human or material level,—is apparent throughout Eucken's entire system, if such his arbitrary construction of theology and religion can be called.

"Spiritual energy in civilization has power (he declares) only in a revelation of an independent spiritual world." Here, he says, is the threshold of religion. "All spiritual creation, moral action, artistic production, appears to be found in the living presence of a higher Power."

Hence comes the "Universal Religion." It encompasses all life instead of making a separate realm from which comes a "peculiar influence." But it is through the *peculiar* influences,—*i. e.*, I suppose, the consciously personal and individual experiences of this universal religious flow,—that there comes to be a "Characteristic Religion," and this is first reached through the checks, the shocks that human life exhibits, like



the collision of atoms in the world's evolution. Spiritual life is roused to a conception of Deity, and, in "developing its relation to the Divine, engenders a Characteristic Religion."

Here we have an adroit almost amusing adaptation of the law of evolution by the collision of material particles, to the evolution of the religious sense, and so, finally, of the idea of God, as if the thought of God were not necessarily the very *spring* of all religious conception and action as such, and not their outgrowth; as if, again, the circumference can create its centre,—not as something that has necessarily been there all the time, but as something that for the individual now first exists, thus concentrating the universal religious flow into an individual experience.

Eucken goes on to show how, at the apex of man's rise, there comes the approach of Deity to man; and this, as not limited to "occasional points of contact!" That is, as I understand him, not in single Incarnations. God makes man the partaker of the fulness of His own life: "its deepest mystery is that the Divine enters into the Human without losing its divinity." "Man becomes immediately conscious of the infinite and eternal, of what transcends the world."

It would be interesting to know just on what facts in recorded human experience Eucken is basing this sweeping statement. Surely it is not what the history of all primitive revelations declares; nor is it the experience of the average man of to-day as we know him, to be "intuitively conscious of the infinite and the eternal and of what transcends the world." When Revelation has awakened in the mind these thoughts and images, then man becomes more or less conscious of them; but never, so far as we learn from history, only of his immediate consciousness. If it be objected that Revelation itself is the means of an immediate or intuitive vision and inward hearing on man's part—this would upset the theory of Eucken, because it would assert the "Characteristic or individual Religion" as the origin, instead of the "universal stuff or flow, out of which this individual religion is supposed to be gradually engendered.

In the same fanciful vein Eucken continues that the "love

of God becomes the ruling motive of the man's life, and brings him an inner relation with the whole scope of reality." Truly a marvellous result of a purely self-conceived image of the infinite and the eternal or the coming into man's life of the universal religious flow; for he asserts that this flow "must all remain human and a part of the *Universal Religion*." "If it cuts itself off in a peculiar religion and evolves a specific piety it easily sinks into rigidity and pharisaic conceit." Dogmas and rites, he says, are expressions of their types of spiritual life, but should be constantly changeable to meet the great transformations taking place in the world of thought.

"While we criticize the tradition of forms, we must develop the *essence of religion* more vigorously and bring the new life which unfolds itself in religion into full action and transform it into our own life. This will protect us against all paralyzing doubt!" and "give us a sure foothold on the storms of the age. Life and its activity alone can produce a Religion of life!"

There must be, he says, an "impartial criticism." "Such criticism does not lead to disintegration when it proceeds from the kernel of religion itself, instead of from the outside." But since all comes from the "outside," we are compelled to ask here, why not criticism from the "outside?" Where is the kernel of religion but in the "outside," the flow? Especially if the flow when arrested by dogma and piety into "character religion" becomes thereby vitiated or contracted?

Swedenborg has told us that "all religion has to do with life and that the life of religion is to do good. But the good he clearly defines as something in accord with the revealed will of a Being of perfect love and wisdom,—this revelation being in the form of precepts, or commandments laying down man's duty toward God and toward the neighbor, which are to be obeyed in the common acts of life. It seems much like a strain of high-sounding but empty words—this talking of doubt being cured by a religion with no permanent convictions and no teaching; and of a new life being entered into, by establishing the self-engendered Deity in the centre of one's being and as identical with one's self. For, that every aid from tradition, or external rite or a recognized supernatural, whether in a



Gospel or a miraculous birth and resurrection and historic redemption, is to be utterly cast aside, is one of Eucken's most emphatic demands. To worship Jesus, he says, "would be the intolerable deification of a human being!"

Eucken, therefore, has no need of a central Lord of Life or Divine Redeemer other than the God conceived of as a powerful, a loving "Omnipresence that enters into life with its reinforcing redeeming effects."

The Virgin birth of our Lord is rejected and therewith the Resurrection and Ascension. Only the human Jesus remains, His incomparable life and His teaching of the dignity of man as the child of God.

"The Virgin birth (says Eucken) is as irrelevant to the faith and a living Redeemer as is the empty grave."

Throwing away, in this manner, all the Church's strongholds of a divine Revelation and a heavenly Doctrine, Eucken offers, after all, little besides a flow of eloquent phrases and poetic fancies for the final refuge of the human soul seeking rest in a rational conviction or a spiritual faith:

"I admit (he says) the waters of the surface are all against religion; but the under currents of man's soul are all in its favor. Modern culture has given us many a problem for which it is, (itself), no match!

"This yearning and craving amid the unwholesomeness of a secular merely human culture, the intolerable shallowness of life which cannot reach beyond its circuit, this rush to a first principle without love or without soul,—how do you account for them?

"On the other side, the profound longing for greater stability and permanence! This yearning to partake of the 'higher life' than that which the process of natural or social self-preservation will allow us!

"Believe me, this incessantly growing impulse running through all nations and all civilizations of the East and of the West is in itself a proof that powers are at work in our souls of which our critics will have to give account!"

Which is somewhat of an anticlimax; inasmuch as no critic will be more called to account for this mental unrest than he who, like Eucken himself, has cast aside all objective aid and supernatural authority, and trusted himself only to the undirected and turbulent "flow" of purely natural self-evolved religion. How almost pitiful is the adoption of this stagelike

artificial tone of a pious humility and dependence which it is the object of the entire argument to destroy as a thing only of the past!

"We are seekers! (he says) our achievements are not perfect yet!" Is he in earnest here, or is it quite innocently, that he introduces this bit of satire out of Goethe's Faust,—where Wagner, the student, says to the master—"I know much! Still I would know all!"

"We are serving (says Eucken), a great end which is not the creation of our brains, but set up for us in the process of evolution!"

Why not let it be a "creation of our brains"—if the "process" is all the cause of the great end which we are to serve!

"We are partakers of the work of the Spirit: nothing can be in vain if done with a view to our great end and a faithful fulfillment of our task."\*

But how can a man do anything with a view to one's "great end," or with a view to a "task," which end and task have never had an existence prior to their evolving in human experience, and have never been made known by revelation to man; nor ever can be known as a finality, but only as a guess or an assurance for the time being?

To sum up Eucken's position, it would seem to be that we are in an inmost flow of spirit seeking a centre or divine, instead of being ourselves in the outer sphere recipients of the influx from an eternal, all-forming, all-sustaining Divine within. But that this so-called spirit is other than a refinement of matter, or of the unintelligent, would seem to follow from the proposition that it is only through a process of evolution that it attains to these qualities and enters upon the realms of mind and morals and the finally-to-be-evolved divine.

#### BERGSON.

To turn from Eucken to the other acknowledged leader of the philosophic thought of the day, Professor HENRI BERGSON, of the College of France, it is a relief to handle principles

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\*For the above extracts, see Rudolf Eucken. London. 1911. *Notes for Religion and Life.*



which are honestly held out without any garb of religious affectation, and which yet are quite as serviceable for arriving at a reason of religion as are those of more sanctimonious name.

BERGSON is thoroughly honest, plain-spoken and fearless in the announcement of his ideas, and his very system guarantees his boundless freedom in carrying them to a result, inasmuch as all systems, all knowledge, all life, all reason itself is only, according to him, forever in the making; never made, never complete,—not even known or completed in thought beforehand. Life is the flow of an eternal now, which is eternally new because made up anew each instant of all the past, and so shaping, controlling anew, all the future.

In the place of Eucken's flow of "spirit" and of "universal religion," Bergson unfolds to us the flow of universal vital impulse, the *elan vital* which seems to consist, at first, of purposeless motion, but which acquires purpose, character, plan, anticipation from its constantly new relations to its counterpart in the universal being—*inert matter*. This affords the reaction, the bumps and shocks and turnings which shape the vital impulse into character, or consciousness; this consciousness, in turn, struggles against its confining shell of matter, until here and there it bursts through into a realm of freedom from restraint,—and so into a domination over matter itself. This is reason and the free intellect, and in its freedom it becomes creative and each new moment of consciousness is the birth of a new world.

Thus what is given as presupposed in Bergson is a dual world or an existence of two elements, *vital impulse* and the crust or covering of *inert matter*.

The whence of these he does not trouble himself about except negatively, inasmuch as his very system requires that God or the End, Purpose, and Plan of the Universe could never have existed at the beginning, since it is only coming into being, or shaping itself, as it goes along. As our consciousness, our life, our destiny is not promised for us beforehand—is not "ready-made"—but is always in the making, so is God, as intention, conceived of as the End or shaping destiny of the world also always in the making.

It is this freedom from any restraint, whether of an original plan or of a present control, that, according to Bergson, brings the long-desired solution of the problem how to reconcile man's freewill with a course, preordained from the beginning. The solution is in the bringing of the entire universe, all life and being, to its centre in the individual self which is conscious only of the now. This again is evolving the centre from the circumference and making the universe self-centered rather than God-centered.

However deficient and revolutionary this system may seem in its relation to traditional thought and belief, there will be found in it points of deepest interest to the student of Swedenborg, as they seem to unite in a way, in opening to the philosopher, a new stand-point for a universal world-view and a real advance in spiritual thinking.

While nothing could be farther from Swedenborg than the abolishing of a God of infinite love and mercy as the source of all things and as determining and governing all things by predetermined laws of Order, still when we come to analyze the idea of the past and the future as terms of time and not of eternity and think of God from the latter idea, or as the *eternal now*, we may find a reconciliation between what seemed before only conflicting ideas. If the soul's consciousness of the "now" embraces all its finite being, why should not the consciousness of the Infinite embrace eternity in its now, and behold all as present?

Unquestionably Bergson's idea of freedom as that of the vital impulse breaking more and more through the bonds of inert matter is entirely in accord with Swedenborg's teaching of the reverse process of God's self-limitation in the evolution of human freedom; so that, like the Father to the Prodigal, He divides his living among his sons, and that only so, out of a society of souls conscious of themselves as free, could God build up really a heaven to eternity.

The meaning of this freedom as a factor in evolution, and perpetual creation all lies in the conception of time and of "the now."

There is, according to this idea, no past and no future in



man's actual life, nor will there ever be; man's whole life is in the consciousness of the now and this is the product of all the past and, the womb out of which springs the future, but a future of perpetual new births.

Especially interesting to the student of Swedenborg's psychology is Bergson's doctrine of the nature and the function of the memory as building up the now, out of the past, and as thus constituting a kind of perpetual limbus or spiritual body which shall preserve our identity. Duration, (*la Durée*) does not suggest a distinct past still existing, or a distant future; it is merely the perpetual flow, in the present moment, of the past into the future. Time is constructed by the aid of memory out of this duration by an *intellectual* effort; but the more real life is not this intellectually created and formed world of time, but the world intuitively felt in the ever recurring now.

It is easy to see how this all bears upon the doctrine of predestination, and of the eternity of the heavens or the hells. The fixed "intellectual" terms of time are to be translated—as affecting our real conscious life—into the intensive terms of state. As to memory, according to Bergson:

"Memory adds continually to present state and so forever builds anew.

"Duration is the continuous progress of the past which gnaws into the future and moulds, as it advances.

"The past is not put away; it follows us up at every instant.

"We think with only a small part of our past, but we desire, will and act, with our entire past our entire bent of soul.

"Our duration is irreversible; we can see our memory, from our intellect but not from our will." Compare with Swedenborg's Doctrine of the external and internal memory. (*H. H.* 462-469.)

"What we *do* depends upon what we *are*: we *are* also what we *do*, and so we are creating ourselves continually." "To exist is to change."

Bergson's doctrine of the soul's Immortality, affords, perhaps, better than any other one feature, a basis of comparison and of valuation—by the side of other systems. There would seem, at first glance, to be a distinctly Christian idea in this placing of will higher than thought, this making the interior and will-memory the enduring one, and making the life to consist in the deed rather than in the thinking about it. What

could be more graphic, more refreshing, frank and bold than this description of the relation of life and nature.

"All organized beings from humblest to highest, from first origins to now, everywhere and always, evidence a single impulsion—the *inverse* of the movement of matter, and in itself indivisible. All the living hold together and all yield to the same tremendous push; the animal takes its stand on the plant, man bestrides animality, and the whole of humanity in space and time is one immense army, and all spring, beside and before and behind each one of us, in one overwhelming charge, able to beat down every resistance and clear the most formidable obstacles: perhaps even death!" (p. 27).

Here we seem to have an intimation at least of personal survival after death, as possible. But here again we are to be disappointed, as throughout Bergson's entire system, by the return of the fatal blight of Orientalism with its doctrine of the final absorption of the individual into the whole.

Regarding personal immortality, he says:

"If there are souls capable of independent life, whence do they come?—When do they enter into this body arising from a mixed cell derived from the bodies of parents?

"We can answer only by resolving to see the life of the body just where it really is on the road that leads to the life of the spirit; but it will there have no longer to do with definite living beings" (ibid, p. 269). That is, the personality is lost!

"Life, as a whole, from the initial impulsion that thrust it into the world will appear as a wave which rises and is opposed by the descending movement of matter. This opposition drives it into a vortex; it divides it into distinct individualities. Then souls are continually being created, which, nevertheless, in a certain sense pre-existed.

"Souls are nothing else than little rills into which the drive of life sunders itself, flowing through the body of humanity."

So we come back to only a familiar form of Orientalism.

What is unique about Bergson's philosophy is that it asserts the doctrine of the flux as belonging not only to everything else, but even to his own system;—if that can be called a system which is momentarily changing, and is building itself up, not on a foreseen plan, but on a plan that develops from stage to stage. The end of this development seems, in Bergson, to be the sad end of the pessimist—the dissolution into the original formless but creative life-impulse; and so the loss of all in-



dividual immortality. But why, if all things change, may not Bergson's vision change as to the end of life's prospect? Why may he not rise, too, to the conception and conviction of the motive of creation itself as nothing less than the Infinite Love desiring to provide for man a heaven to eternity?

#### CONCLUSION.

Finally, as to the spiritual content to be found in either of these two popular systems.

We must define, first of all, what we mean by "spiritual." If spirit is a refined order of ether; or a kind of spermatic dust scattered through the universe; or a "universal religious sense" of a supernatural that is capable of producing a God and destroying him to be replaced by another,—then both of these systems have this content not only in abundance but to the full—as the very working principle of the evolution of a centre from the expanse, or of reason out of that which was without reason.

But if by the spirit is meant the life of will and thought proceeding from God's infinite Love and Wisdom, like heat and light from the spiritual sun of a spiritual world, and flowing down into human minds on earth as into its formed receptacles,—then we must regard these systems as offering no place for such a content. As Swedenborg with his powerful and awful directness and clearness states it:

Those who say that they believe in an invisible Divine, which they call the Being of the universe from which all things had their existence, and reject belief in regard to the Lord, are shown *by experience* that they believe in no God; because the invisible Divine is to them something like nature in her first principles, which is not an object of faith and love because it is not an object of thought (*Heaven and Hell*, n. 3).

That is, it is like looking upon vacancy for our object of vision, or like endeavoring to feel the throbs of affection beating upon us from a problem in geometry. Even the eternal rule of three we cannot turn into a God whom we can love and worship, nor can we from a multiplicity of such rules, conceive of the evolution of motion, of a world and of man.

## A GENERAL COMPARISON OF SWEDENBORG'S POSTHUMOUS OR "LESSER PRINCIPIA" WITH THE PUBLISHED PRINCIPIA.

BY PROF. REGINALD W. BROWN.

### Introductory Note.

Swedenborg published his *PRINCIPIA RERUM NATURALIUM* as the first volume of the *OPERA PHILOSOPHICA ET MINERALIA* in 1734. Prior to that date he wrote a similar work with the same title—*PRINCIPIA RERUM NATURALIUM*—distinguished by Dr. R. L. Tafel as the "Lesser Principia." This work first appeared in print in the original in 1908, and again more recently in an extremely untrustworthy English translation, under the title "Minor Principia," by the Rev. Isaiah Tansley, B. A., which was incorporated in a revision of Clissold's translation of the *PRINCIPIA*.<sup>1</sup> The date of this posthumous *PRINCIPIA* has not been definitely established; but Mr. Alfred H. Stroh, as Editor of the Latin edition, states that "it is in all probability the manuscript work referred to by Swedenborg in a letter dated Nov. 27, 1729."

It would be impossible, in a brief space, to give a complete comparison of all the details involved in the cosmological systems of Swedenborg's posthumous and published *PRINCIPIAS*. But, since the basis of each system is a genetic series of entities or particles and a successive evolution of solar and planetary systems, a general comparison of these may prove of value to the students of these works in stimulating further efforts to arrive at a just idea of the relation between them.

In the published *PRINCIPIA* Swedenborg distinguishes the

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<sup>1</sup>In the present paper all quotations from the "Lesser Principia" have been made direct from the Latin, as we have found it impossible to use the published "translation," owing to its glaring inaccuracies. These have been indicated, at length, in a review of

the translation published in the *NEW PHILOSOPHY* for July, 1913. Moreover, for reasons which will be sufficiently evident from the same review, all references to the *PRINCIPIA* are made to the translation by Mr. Clissold, published in 1845.



series of entities arising from the first natural point as a seed, into two distinct classes—finites and elementaries. The finites again, he shows, may exist under two conditions, either free as actives,<sup>2</sup> or in composition as finites properly speaking. In the genetic series of this work there are five successive degrees of finites; the finites of each degree, when free, all being capable of becoming actives; there are also four successive degrees of elementaries. These series of particles are the primordia out of which solar and planetary systems are formed, and from and according to which they derive all their characteristic qualities and activities.

In the posthumous work the author presents a similar though far less complete series of entities arising likewise from the first natural point as a seed, but he does not distinguish the several classes of entities by the same names as he did in the published work. He does not speak of finites, actives, and elementaries as such, but he applies to all alike the term *particles*, distinguishing them by number only, according to the order of their successive formation. Thus the first natural point is called the "particle of the first kind," the first natural point active the "particle of the second kind," and so on till we reach the water-particle, which is the "tenth particle" in the order of formation, and the particle of water vapor which is the eleventh. It is essential to bear in mind this difference in nomenclature in correlating the two systems.

The particles of the LESSER PRINCIPIA answer, in a broad general way at least, to the points, finites, and elementaries of the later work, but differ greatly from them in many particulars, both in regard to origin, composition, form, and number. Thus in the LESSER PRINCIPIA there are two intrinsically different kinds of points corresponding to the one of the later work; only two distinctive finites, the fifth and eighth particles, answering in a general way to the series of five finites in the later work; no actives are mentioned except in the case

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<sup>2</sup>"The actives are the same as PRINCIPIA I, vii, p. 185. finites in a state of liberty."

of the second kind of points;<sup>3</sup> and there are but three distinctive elementaries, the third, sixth, and ninth particles, in place of the series of four in the later work. In the future, students will undoubtedly be able to reconcile these two different systems, either by recognizing a development in Swedenborg's cosmological theories, or by some more intimate correlation. This reconciliation I pass over for the present, and simply attempt to lay before the reader as accurately as I can the facts of the case as presented by Swedenborg himself.

### Summary of the "Lesser Principia."

A brief summary of the LESSER PRINCIPIA will aid the mind in following the detailed and comparative treatment to be presented later. The greater part of this summary is presented diagrammatically in Plate I, which the reader should keep before him. The numerals in the various figures refer to the kinds of particles according to the nomenclature of the LESSER PRINCIPIA; for instance, 2 in Figures 2, 3, 4, and 5 indicates that the sun is composed of particles of the second kind; likewise 3 and 4 in Figure 3 indicates that the regions in which these figures occur are occupied by particles of the third and fourth kinds respectively; etc. In brief then:

1. The Infinite by infinite or pure motion produced two kinds of first natural points (*L. P. 23*), the one quiescent in its nature and called the *particle of the first kind* (*ib. 26*), the other active, called the *particle of the second kind* (*ib. 27*).

2. These relatively passive and active points combine together to form *particles of the third kind* as the units of a universal element or atmosphere. This stage of the cosmology is represented in Plate I, Figure 1. The quiescent points, or first particles, occupy the surface of the third particle, which is bullular, while the active points or second particles occupy the enclosed active space and also an active sphere

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<sup>3</sup>The active points in the LESSER PRINCIPIA function not only as the actives of the point of the later work, but also as the actives

of the first and second finites, and even as active first elementaries in the composition of the ether (see below, Sec. 6).



surrounding the particle, as illustrated in Plate V, Figure 1. (*L. P.* 28, 29, 66.)

3. Suns or stars are formed at various points within the expanse of this universal element, their active spaces being composed of active points or second particles. These suns begin as small spaces gradually increasing in size with the addition of second particles.

Such is the origin of the sun of our solar system as represented in Plate I, Figure 2. Some of these suns grow at the expense of others which consequently disappear. (*L. P.* 62-64.)

4. The active points within the sun, by reason of their internal conatus and consequent local motion, conspire together to produce a powerful vortex within the sun, which as it increases in size presses outward, and also axillarily upon the surrounding and as yet homogeneous<sup>4</sup> third particles of the universal element, compressing them individually, and dragging them in volume into vortical motion, as a liquid is drawn into a vortex by a paddle rapidly rotated in its midst,<sup>5</sup> with a motion greatest at the center of activity and decreasing according to the distance from it. In this manner the solar vortex is formed out of third particles, within the universal expanse of these particles. This stage of the vortex is represented in Plate I, Figure 3, where the shading indicates the degree of compression. The variously compressed third particles in the vortex Swedenborg calls *fourth particles*.<sup>6</sup> (*L. P.* nos. 65, 101-102.)

5. During the compression of the third particle, the surface matter, consisting of particles of the first kind, is forced in through the polar cones to the center, where it is formed into a *central globule* (Plate V, Figures 2 and 3), which increases in the degree that the particle is compressed, until finally all the surface becomes absorbed in the central globule,

<sup>4</sup>*L. P.* 62.

<sup>5</sup>*Ib.* n. 84.

<sup>6</sup>Finally, Swedenborg seems to picture the solar vortex as consisting of fourth, or more or less

compressed third particles with central globules, and of these only. (*Ib.* 144.)

as represented in Figure 4 of the same plate. During the process the third particle entirely loses its elementary character, being changed into a hard, unyielding, inactive finite, called the *fifth particle*. At this stage of the solar system the sun becomes surrounded with a crust of such particles, and is consequently obscured. (*L. P.* 59.) This stage is crudely represented in Plate I, Figure 4, and in greater detail in Plate III, where the compression of third particles according to their proximity to the sun is clearly indicated, as also the formation of the so-called fourth particles (4, 4, 4, 4,), with larger and larger central globules toward the region of greater solar pressure, and finally the formation of the fifth particles immediately around the solar space. The existence of these fifth particles incrusting the sun is given as the cause of sun spots. (*L. P.* 86.)

6. The fifth particles, by means of active points or particles of the second kind in the sun and interfluent between them (*L. P.* 88), are formed into the second distinct series of elementary particles, namely, *sixth particles* or those of the *ether* (*L. P.* 89). These sixth or ether particles are exactly similar in form and structure to the third particles of the first element, and may also be represented in their pristine state by Plate V, Figure 1,—the surface in this case consisting of fifth particles, and the active interior and the sphere, of active points. The solar vortex at this time seems to have been conceived of as similar to Plate I, Figure 5.

7. At this stage a great change is said to take place in the disposition of the more or less compressed third or fourth particles in the solar vortex. In the early stages, when the sun is forcing the first element about it into a vortex, the resistance, and therefore the compression, is greatest at the center, and the more compressed or denser particles are formed near the sun, the remaining particles ranging outward, more and more expanded according to their distance from the sun. But when the vortex motion is completely established, and the resistances equilibrated, then the centrifugal tendency due to rotation causes the more compressed or heavier particles to migrate toward the boundaries of the vortex, and the more expanded



toward its center, the original arrangement being therefore reversed (*L. P.* 84, 101), as represented in Plate I, Figure 5, by the reversal of the shading of the first element.

8. There is some obscurity at this point as to Swedenborg's conception of the origin of the planetary vortices. In numbers 86 to 88 of the *LESSER PRINCIPIA* he seems to indicate that the crust of fifth particles around the sun was disrupted before ether particles were formed; whereas his general argument would lead us to conclude that he thought that this crust of fifth particles was used up in the formation of a sphere or "crust" of ether around the sun (*ib.* 101, 107), as represented in Plate I, Figure 5; and that this sphere of ether, on account of the centrifugal tendency of rotation, becomes disrupted, forming ether spheres or primitive planetary vortices *without as yet any planetary globes within them*, as illustrated in Plate I, Figure 6. If this last is not Swedenborg's idea, he at any rate conceived that all the fifth finites were absorbed in the formation of ether spheres immediately after the disruption of the primitive crust formed of them.

9. These ether spheres revolve around the sun, carried by the solar vortex of fourth particles, and gradually receding from the sun until they reach their place of equilibrium in the vortex (*L. P.* 101, 104). They are made to rotate, Swedenborg says, by virtue of the fact that the velocity of the solar vortex, and therefore its action, is greater upon the hemisphere turned toward the sun, than upon the opposite hemisphere (*ib.* 102).<sup>7</sup> This differential action of the solar vortex from without upon the terrestrial ether-sphere is made to account for a vortical motion in the ether-sphere, the velocity of which is greater at its boundaries, decreasing toward the center. This vortical motion is the origin of the terrestrial vortex with a centripetal tendency. (*ib.* 106, 107.)

10. The centripetal tendency causes a gradually increasing pressure toward the center of the terrestrial vortex (*L. P.* 108), whereby the sixth (ether) particles become compressed

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<sup>7</sup>Note that this theory of Swedenborg's would make the terrestrial vortex and the earth it-

self rotate in the opposite direction from which they actually do.

in the degree of their nearness to the center, forming *seventh* (or partially compressed ether) *particles*, with central globules and similar in all respects to fourth particles except as to size (*ib.* 137-140). This stage of the cosmogony is represented in Plate I, Figure 7, where the shading; as before, indicates the degree of compression, in this case greatest at the center. The seventh particles themselves are illustrated by Plate V, Figures 2 and 3, as were the fourth. The seventh particles, says Swedenborg, constitute "the true matter of the tellurian vortex" (*L. P.* 144), indicating that he perhaps conceived that no uncompressed or primordial ether-particles without globules remained after the vortex was completely formed, or at any rate that they occupied only the outer regions of the vortex.

11. In time the pressure toward the center becomes so great, that at the center of the terrestrial vortex seventh (or, if you will, the sixth) particles are completely converted into hard globules or *eight particles*, similar in all respects to their prototypes the fifth particles, except that they are composed of a congeries of these fifth particles, whereas the fifth particles themselves are composed of quiescent points or particles of the first kind. The eighth are therefore larger than the fifth particles (*L. P.* 141-142). The existence of these eighth particles at the center of the vortex at this time is represented diagrammatically in Plate I, Fig. 8.

12. By the motion of the particles of the fourth kind which penetrate the interstices of those of the eighth kind, the latter are woven into a new or spherical type of elementary particles, called the *ninth or air particles* (*L. P.* 143), whence the air-sphere arose in the center of our tellurian vortex, as represented in Plate I, Figure 9, before any sign of a permanent solid or even liquid tellurian globe or earth had made its appearance.

13. The centripetency of the terrestrial vortex causes a compression of the air toward the center of the vortex, as indicated in Plate I, Figure 10 (*L. P.* 144), so that the individual air particles are compressed into smaller and smaller dimensions the nearer they are to the center (*ib.* 145), their super-



ficial eighth particles being formed into small bullular *spherules* (*ib.* 147 and Fig. 94).<sup>8</sup>

14. When the air particle becomes so compressed that the greater part of its surface is transformed into the small spinerules so as to completely fill the interior cavity, it loses its elementary characteristics and the *water or tenth particle* comes into existence (*L. P.* 160, also Fig. 98), which can be compressed no further (*ib.* 162). With the increase of these water particles at the center of the vortex, a tellurian globe of water is formed and grows, until it finally reaches the dimensions of our earth (*ib.* 163). The depth of the primeval ocean then according to this work extended to the very center of the earth (*ib.* 164) without any core of other matter,—as represented in Plate I, Figure 11.

15. As a result of the inactivity of the water particles, and the tremendous pressure in so deep an ocean, a large percentage of water particles are broken up (*L. P.* 164), giving rise to *saline, rocky and metallic particles*, so that "after various changes, solutions, motions, and compressions of particles, a substratum (*fundum*) was formed, and the waters or ocean were partly covered over with a crust" (*ib.* 163), as represented in Plate I, Figure 12.

16. *Vapor or eleventh particles* are similar to air particles, except that their surface is said to consist of water particles and their interior space of particles of the fourth and seventh kinds, or what is the same, of particles of the first element and ether partially compressed (*L. P.* 170).

### Comparison with the Published Principia.

With the foregoing summary before us, we now proceed to analyze in a general way the theories of the posthumous PRINCIPIA, and to compare them with those of the published PRINCIPIA.

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<sup>8</sup>Swedenborg does not distinguish the partially compressed air particle by a separate number, but

calls the fully compressed particle the tenth.

## 17. THE FIRST NATURAL POINT.

In the LESSER PRINCIPIA, as in the later work, Swedenborg calls the first of finition the First Natural Point, and compares it to the mathematical point of geometry. "This natural point (he says) we assume to be almost the same as the mathematical point." (*L. P. 2. Cf. Princ. I, ii, 2, 7.*)

In the LESSER PRINCIPIA as in the later one he ascribes creation to the Supreme Deity,— the Infinite,—saying, that

"We must, by all means, have recourse to something infinite, and acknowledge a nature-producing nature, or a Supreme Deity and prime mover, who is without any geometrical attribute or quality, who alone is greatest and least infinite motion, and who by His infinite motion in a place infinitely small gives rise to the point from which geometry commences and derives its primordia, according to whose rules all nature afterwards acts." (*L. P. 1<sup>6</sup>. Cf. Princ. I, ii, 1-5, 20.*)

[As to the state preceding the point] our mind is blinded, there is nothing here except what is infinite and surpassing comprehension.<sup>9</sup> Nor does it seem possible to express the matter otherwise than that there was an immense void, the beginning of that nature which is subject to laws and geometry, and that the first origin was only infinite motion in a point infinitely small (*L. P. 1<sup>6</sup>*).

"We cannot define this point otherwise than as having arisen from infinite motion in a place infinitely small; consequently from such infinity something definite appeared, that is, the first natural point, from whence all other things derive their origin; and, with this same point, was born geometry, or nature which is subject to geometrical laws. This point seems to be something bordering between the infinite and the finite. It participates of both, that is, of infinite nature which has no geometrical rules such as our world has, as well as of geometrical nature. By means of this point one may enter, as through a door, into that nature which is obvious to our senses and has [actually] become nature." (*ib. 1<sup>7</sup>. Cf. Princ. I, ii, 10.*)

Compare the statement that "this point seems to be something bordering between the infinite and the finite" with the statement in the published PRINCIPIA, that the first natural point "is a simple ens, and the first, existing from the Infinite by means of motion; and thus that, in respect to existence, it is a kind of medium between what is infinite and what is finite." (*I, ii, 6.*)

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<sup>9</sup>*Cf. Princ. I, ii, 12.*



Compare again the statement of the LESSER PRINCIPIA that the point participates "of infinite nature \* \* \* , as well as of geometrical nature," with the following in the published PRINCIPIA: "On the one hand it [the point] acknowledges the infinite, and on the other the finite; thus it stands between the two, and looks as it were both ways, having respect as well to the immense infinite, as to the immense finite; and in reference to its existence, may be said to participate of the nature of both." (I, ii, 10.) From these and many other parallel statements the identity of the point in both works is clear.

But attention might be called to an important statement in the LESSER PRINCIPIA which indicates in a very definite way how Swedenborg conceived of the point partaking both of the finite and of the infinite. Speaking of the figure of the point and of the internal motion which gave rise to it, Swedenborg says in a marginal note: "*Let the point be finite and the motion infinite*" (n. 2<sup>3</sup>). That is to say, the point, in respect to its ability to enter as a part into the composition of a succeeding entity, or in respect to its action upon composite entities by virtue of its local motion, is finite and within the sphere of geometry; but in respect to its internal nature and state, as an entity which cannot be said to consist of parts, arising as it does immediately from the infinite, it is infinite. This agrees perfectly with the whole treatment of the point in both works, but it appears more definitely in the LESSER PRINCIPIA where Swedenborg speaks distinctly of the "infinite [or internal] as well as the finite [or local] motion of the first natural point" (n. 2), though the same differentiation is clearly involved in the pure or infinite, and local motion of the point in the published PRINCIPIA.<sup>10</sup>

In regard to the infinite aspect of the point let me quote once more from the LESSER PRINCIPIA. Swedenborg says,

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<sup>10</sup>Princ. I, ii, 22; v, Appendix on the Active of the Point. Here it is stated that the point by its local motion, becomes, as it

were, substantial, *i. e.*, finite according to the definitions of the PRINCIPIA. (Cf. I, iv, 2; iii, 13.)

"We assume this natural point \* \* \* to be definite not infinite, or as participating of both; but how this finite could have been created has been told. \* \* \* It is not within our judgment to determine how, from infinite things, something finite can be produced; but since nature or that nature which follows natural and geometrical laws, begins here, we must therefore commence from that point, which, as to some part of it, is definite, and not from that which is purely infinite." (n. 2.)

Swedenborg speaks quite at length of the contacts and collisions of points, (*L. P.* 13-17), and describes the various consequences that follow from the collision of the points, (*ib.* 18-22)<sup>11</sup>; he even goes so far as to state that a body composed solely of points has weight, (*ib.* 83), and that by reason of the almost infinite velocity of their local motion, notwithstanding their infinitesimally small mass, they are able to exert a [mechanical?] pressure upon composite entities. (*Cf. Princ.* I, vi, 5, 18.)

In comparing Swedenborg's treatment of the first natural point in his two *Principias*, it is essential to bear in mind the distinction he makes between the *infinite or internal* and the *finite or local* motions of the point. In the *LESSER PRINCIPIA* almost the whole treatment of the point, (nos. 2-22), refers to its finite or local motion, only one number (23) dealing specifically with the infinite or internal motion; whereas in the later *PRINCIPIA* the bulk of space (I, ii, 12-22) is devoted more especially to the internal nature and motion of the point.

In the posthumous work, after a general introduction on the origin and general nature of the point, Swedenborg devotes over thirty pages (nos. 2-22) to a description of the local or finite motion of the point. He then returns to a more par-

<sup>11</sup>It should be noted that Fig. 25, of the *LESSER PRINCIPIA*, illustrating the effects of the collisions of first natural points is identical with Fig. 5 of the published *PRINCIPIA* illustrating the effects of collisions of the actives of the first finite.

Two very interesting marginal annotations occur in the MS. in

connection with the statements in regard to the collision of points. The first is at the end of n. 17, where Swedenborg has written: "N. B.—They do not easily collide." The second, at the beginning of n. 18, where he has written "N. B.—This must be better examined."



ticular consideration of the internal, infinite, or pure motion which gave rise to the point, and the conatus by virtue of which it has its external, local, or finite motion.

In regard to this internal motion within the point, he states that

"Since we have said that the natural point, whose description we have thus far given, arises from a kind of infinite motion, and that this finite derives its origin from the infinite, therefore, it is our aim to describe, to some extent, the infinity of this first motion, although it cannot be demonstrated geometrically." (*L. P.* 23. *Cf. Princ.* I, ii, 12.)

"The first motion is pure motion, and it is spiral, leading from the very center to the periphery, so that in such motion the positions of the poles are infinite, and the gyration infinite; and the motion is of most perfect gyration; whence must arise that other spiral motion, [the finite local motion of the point], a description of which has already been given in the foregoing pages." (*L. P.* 23, heading. *Cf. Princ.* I, ii, 21-22.)

He also shows that this infinite spiral motion causes "the first natural point to be spherical in form" (*ib.*).

#### 18. "POINTS OF TWO KINDS EXIST," CALLED FIRST AND SECOND PARTICLES.

Now follows a very remarkable distinction which we do not find in the later *PRINCIPIA*. Swedenborg says that two kinds of points exist by reason of "slightly different" (*exiguam modo differentiam*) internal motions. In one kind the center of the internal motion, he says, is quiescent or does not shift; and it follows:

"As a consequence, that such a point, \* \* \* rests in its own place.

"This spiral volution always returns to its own center,<sup>12</sup> wherefore since there is no change or transposition of the center, it follows also that no motion around any other center can be conceived of, unless it be actuated by some force; therefore the first point is that whose center is quiescent. This (he adds) is the most natural and most perfect origin" (*L. P.* 23<sup>4</sup>).

In the second kind of point, the center of the internal motion constantly changes, causing a local motion of this point

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<sup>12</sup>As illustrated in Plate IV, Fig. 27 of the *LESSER PRINCIPIA*. 1, which is a reproduction of Fig.

from place to place. As to this point, which is the one which we have referred to as being described at length by Swedenborg, he says,

"It derives its origin from the same spiral motion [as the other], but the motion has only a slight difference, that is to say, the spiral course tends indeed from center to periphery, but it does not return from the periphery to the same center, but to another center in its vicinity, and so on continually.<sup>13</sup> It consequently follows, that the center always changes place and moves progressively from place to place,<sup>14</sup> hence arose the aforementioned fluxion of the point." (n. 23<sup>5</sup>.)

The point with its center quiescent Swedenborg calls the *Particle of the First Kind* (n. 26); and the point whose center constantly shifts and which therefore flows locally into spiral circles he calls the *Particle of the Second Kind*, (n. 27), or more commonly throughout the rest of the work the *Fluent Point*. The first answers to the First Natural Point of the later PRINCIPIA when it enters as a component part into the composition of the first finite; and the second to the same point as an active in its free and natural local motion.

In the later PRINCIPIA Swedenborg does not make any intrinsic distinction between the first natural point which exists in a relatively passive condition in composition, and that which is in an active condition when in freedom. In both cases the point is identical internally, the conatus toward local motion being present alike in both. The only difference is one of conditionment from without, in that all points in freedom would naturally and spontaneously flow into local motion.

Swedenborg's conception of the first natural point, as the medium between the infinite and the finite, and as the seed of finite creation, being the most essential and distinctive feature of his whole cosmological system, it is interesting to note that, with the exception just noted, the treatment of this point in the two PRINCIPIAS corresponds more closely than the treatment of any of the succeeding entities, with the exception of the air and water particles. But a marked difference between the two

<sup>13</sup>As illustrated in Plate IV, Fig. 2, which is a reproduction of Fig. 28 of the LESSER PRINCIPIA.

<sup>14</sup>As illustrated in Plate IV, Fig. 3, which is a reproduction of Fig. 29 of the LESSER PRINCIPIA.



systems appears in the composition, origin, and compression of the succeeding or third particles of the posthumous work, correlating with the first elementary particles of the published work.

**19: THIRD PARTICLES CONSTITUTING THE UNIVERSAL ELEMENT.**

According to the published *PRINCIPIA* first natural points group themselves together by means of their local motion and form first finites, (*Prin.* I, iii), and these first finites, being crowded together by reason of the growth of large active solar spaces, form themselves similarly into second finites (*Ib.* iv, 5; x, 3). Both series of finites by virtue of their internal composition and motion are capable of becoming actives, provided they have freedom (*Ib.* v, vii). The first elementary particles of this work are made to consist of a bullular surface of second finites, the interior space being occupied by first finites in free local motion as actives (*Ib.* vi, 1-4; x, 5).

In the posthumous *PRINCIPIA* there is no mention of any particles corresponding to the first and second finites and actives of the published work; the first natural points fulfill the functions of these as well as the functions of the first natural points proper of the later work. The particles of the first element of the *LESSER PRINCIPIA*, designated as third particles, are formed directly from first natural points,—the relatively passive points or those of the first kind occupying the bullular surfaces, and the active ones or those of the second kind the interior spaces, as already described in Section 2.

The *principle* of the formation of a bullular particle from relatively active and passive entities is the same in both works; the distinction so far, pertains only to the identity of the constituents. The diagrams illustrating the general structure and formation of the particles of the first element in each work are practically identical. Fig. 32 of the posthumous work is virtually the same as Fig. 11 of the published work, and Fig. 33 as Fig. 10. But a most essential difference appears in the diagrams illustrating in detail the polar cones of the particles and the direction of the spiral motion within them.<sup>15</sup>

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<sup>15</sup>L. P., Fig. 37; *Princ.*, Fig. 12.

The reader will probably get the most distinct idea of the points of similarity and difference between the particles of the two works if the similarities and differences be summarized separately, as follows:

**20. *Points of similarity between third particles and the first elementaries of the published PRINCIPIA:***

1. Both are bullular in form.
2. In both the space inclosed by the relatively passive surface is occupied by actives.
3. Both possess a vortical motion and consequent form, with poles and polar cones, and therefore equator, ecliptic, etc. (*L. P.* 32, 35; *Princ.* I, vi, 20).
4. In both cases the polar cones are said to develop during compression. (*Ib.*)
5. Both may be compressed and give rise to finites, but in a different manner as indicated below.
6. Both are described as forming universal atmospheres in whose expanse solar systems exist. (*L. P.* 62; *Princ.* I, vi, 39, 50.)
7. The third particles are described as having a systolic and diastolic motion or animation (*L. P.* 37), which would even more naturally follow in the case of the first elementaries on the basis of Swedenborg's doctrine of vortical motion in the later work.
8. In both cases the element consisting of these particles seems to have been thought of as the cause of gravity (*L. P.* 84, 101, 153, 106, 107. *Princ.* I, vi, 44; III, v, 1; xi, 5).

**21. *Points of difference between third particles and first elementaries:***

1. The difference in the constituent entities has already been alluded to.
2. The third particles of the posthumous work are surrounded by an organized *sphere* of active fluent points (*L. P.* 66). This sphere is made to play a very important role in the theories of the LESSER PRINCIPIA, but no such organized sphere is anywhere mentioned in the published work, though such a sphere seems to be required there. It is said indeed that the actives of the point pervade the interstices between the first



elementaries,<sup>16</sup> but nothing is said of their being specially organized around these particles. The sphere in the case of the third particles is said to increase during compression (*L. P.* n. 78).<sup>17</sup>

3. The vortical flow in the polar cones of the particles of the posthumous work is *inward toward the center at both poles*, as shown in Figures 37 of that work, and in Plate V of the present article, where it will be seen that the sphere is not a continuous one from one pole to the other, the direction being reversed at the center of the particle. On the contrary, the vortical flow through the polar cones of the first elementaries of the published work, as illustrated diagrammatically in Figure 12 of that work, is *through one pole toward the center and outward from the center through the opposite pole*. The first kind of motion agrees with the LESSER PRINCIPIA theories generally, while the latter agrees generally with those of the later work (*L. P.* 35, 47; *Princ.* I, v, 3; iii, 21.) How vitally essential this difference in motion is, any one will at once realize who is at all familiar with the various theories in the later work, which are based on the nature of this vortical motion.

4. During the compression of the third particles of the posthumous work, in accordance with the theory that the vortical flow is inward toward the center at *both poles*, a central globule is said to be formed from the superficial matter carried inward, the globule gradually increasing at the expense of the surface, until all the surface is used up and a solid inactive finite arises (*L. P.* 35, 39, 40, 54, 58). Whereas, in the published work, in agreement with its general theory of vortical motion, the surface matter instead of passing through the walls of the polar cones and onward to the center and there forming a globule, is said to be doubled and tripled, etc., thus gradually thickening and encroaching upon the active

<sup>16</sup>*Princ.* I, v, at end; vi, 5.

<sup>17</sup>This sphere we have illustrated diagrammatically in Plate V, Figs. 1, 2, 3, which is based primarily on Fig. 67 of the LES-

SER PRINCIPIA, but which also incorporates several details brought out in other figures: *e. g.*, Figs. 37, 42, 52-54.

space from without, until finally no space is left, but merely a solid finite.<sup>18</sup> (*Princ.* I, vi, 19-22; vi, *Appendix*, 8.)

5. Although Swedenborg says in several numbers of the posthumous *PRINCIPIA* that the motion of the surface of the third particle originated from the action of the inclosed active points (*L. P.* 30-32); still he makes a great deal more of the apparently opposite idea that

"the inclosed fluent points, or the particles of the second kind, follow the motion of the surface, and are forced around spirally, even to the center,"

causing the motion of the inclosed matter to be greatest at the surface, decreasing both in velocity and spirallity toward the center. (*L. P.* 33-37, 59.) That this is contrary to the general principles of the published work, see *Principia* I, v, 15, 21, also vi, 1, and again *Appendix* to vi, 2, 8. This difference in the conception of the vortical flow within the elementary particle still further accounts for the different theories in regard to what becomes of the superficial matter during compression.

6. The third particles are said to have arisen before the solar space, the first elementaries after it, according to the following section.

## 22. THE ORIGIN AND NATURE OF SUNS.

In both works the general idea of the sun as a center and source of vortical motion is the same. There are however two notable points of divergence: the first as to the constituents of the interior of the sun; the second as to the time of its origin.

1. The constituents of the sun, according to the published

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<sup>18</sup>It is a rather peculiar coincidence that a figure occurs in the original edition of the later *PRINCIPIA* (Plate II, Fig. 14), without any reference to it in the text, which is suggestive of the condition of a partially compressed third or sixth particle of the *LESSE* *PRINCIPIA*, containing a central globule. Some have thought

that this figure might indicate a carrying over of the same conception into the later work, but as said above this does not accord with the general theories contained there, nor does Swedenborg give any intimation of the purport of the diagram, which might easily have been of a very different character.



work, were primitively active first finites only (*Princ.* I, x, 3; v, Heading), with a later addition of active second finites, when these were formed (*ib.* x, 4; v, 20). The interior of the sun then is here made to consist of two kinds of actives. In the earlier work, on the other hand, the interior of the sun is said to consist of active *first natural points*, as already stated (Sec. 3), and of these only.

2. As to the time of its origin, according to the later work the large active solar space was formed prior to the first element, and not only prior to this, but also prior to second finites, being the cause of the condition or contingent whereby second finites themselves arose (*Princ.* I, x, 3; v, 26). In this work Swedenborg describes the formation of the first element as taking place around the solar space; for after speaking of the production of second finites about the sun, he says,

"That both the first and second elementary particles may now take their rise around this large active solar space; and may successively form a sphere, which gradually grows larger; until at length they suffice to form a certain large vortex round the sun. (*Ib.* x, 5.)<sup>19</sup>

### 23. THE FORMATION AND NATURE OF THE SOLAR VORTEX.

The general description of the formation of the solar vortex, so far as the origin and nature of its vortical motion is concerned, is in close agreement in both works. (*L. P.* 65, 101-102. Cf. *Princ.* I, vi, 39, 43.) In both cases the vortex is said to be caused by the powerful vortical motion of the sun as a center, causing a motion whose velocity is greatest near the sun, and less in proportion to the distance from it. In both cases the centrifugal tendency of such a vortex is described (*L. P.* 101; *Princ.* III, v, 1). It is stated that this centrifugal tendency would cause all particles and bodies in

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<sup>19</sup> It has been thought by some, that what Swedenborg says in *PRINCIPIA*, I, x, of the formation of "the large active solar space" prior to the first element may refer to something different from the sun as ordinarily understood;

as this would not seem to agree with the teachings of his theological works. It is difficult, however, to see that Swedenborg himself had any other idea in mind at that time.

such a vortex to adjust themselves according to their several densities, the heavier bodies travelling toward the circumferences, the lighter toward the center, until the whole system became equilibrated according to densities and motions.<sup>20</sup> (*Princ.* III, xi, 5.) Both works agree again in the theory that the excessive pressure around the sun, which was able to compress elementary particles into finites, existed only in the early stages of the vortex, before its forces were equilibrated; so that it was not possible for finites to be formed around the sun in this manner at a later period. (*L. P.* 84-86; *Princ.* I, ix, 10; viii, 4.)

The main point of difference in respect to the solar vortex in the two treatises is in relation to the number of elements or atmospheres which enter into it. According to the published *PRINCIPIA* the vortex consisted primitively of the first element (*Princ.* I, vi, 39), as represented in Plate II, Figures 2 and 3. Later the second element was formed about the sun as the special element of the vortex (*ib.* ix; x, 5-7), and limited to the sphere of the vortex, as represented in Plate II, Figures 3 to 7. The solar vortex, of this work, consists, therefore, of *two distinct elements* co-operating harmoniously in their vortical flow. In the posthumous work, however, no element or atmosphere corresponding to the second element of the later work is described; the vortex is said to consist of but *one element*, namely, the first or universal element partially compressed. The second element formed, according to the earlier work, was the ether, which was apparently thought to have arisen around the sun in a manner similar to the second or magnetic<sup>21</sup> element of the later work, but not to have remained as a permanent vortex around the sun, being afterwards broken up into planetary vortices and limited to these.

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<sup>20</sup> This theory is based on what takes place when a mixture of fluids and solids of different densities is rapidly rotated.

<sup>21</sup> Considering the important role that the theory of magnetism plays in the later work it seems strange that not a word is men-

tioned in regard to magnetism in the earlier one. This makes it more difficult to judge whether Swedenborg at this time had anything definite in mind corresponding to the second or magnetic element of the published work.



24. THE FOURTH OR PARTLY COMPRESSED PARTICLES OF THE SOLAR VORTEX.

The particle of the fourth kind of the earlier work, like its aftertype the seventh particle of the same work, is unique in the fact that it is given a distinctive name or number. The fourth particle is merely a partially compressed third particle, as shown above (Sec. 5), and illustrated in Plate V, Figures 2 and 3, and in Plate III, where a volume of such particles is represented in the region of their formation. This particle is described as still retaining its elementay nature; and it is not distinct from the third particle itself, in the same sense in which any two degrees of the four series of the published *PRINCIPIA* are distinct from each other. The last mentioned entities are entirely distinct from each other not only as to origin and composition, but also as to complexity and order of magnitude; whereas the former do not differ essentially in any of these respects. The only sense in which the fourth particle differs from the third is precisely that in which the first elementary of the later work, with its surface doubled and tripled by reason of compression, differs from the same elementary uncompressed. So far as can be seen there is no discrete degree between the third and fourth particles, but only one of continuity. (*L. P.* 73-82.) Fourth particles might be described as simply the condition in which third particles exist in the solar vortex of the earlier work, for according to the principles of that work it is impossible for uncompressed third particles to exist within the vortex, or within the region of the earth's orbit at least. (*Ib.* 101.) But Swedenborg himself makes the statement, that

The particles of the fourth kind constitute the matter which is everywhere present extending from the sun throughout all the [planetary] vortices of the sun to the limit of the great [solar] vortex. (*L. P.* 144<sup>2</sup>).

So far as the functions of the fourth particles are concerned they take the place, in a measure, of both the first and second elementaries of the later work: first, in the constitution of the solar vortex; and, secondly, in the formation of the air particles, whose interior space they are said to occupy. (*L. P.* 143. *Cf. Princ.* III, vii.)

## 25. THE FIFTH PARTICLE.

The fifth particle is of special interest as the first distinctive finite of the LESSER PRINCIPIA. It is said that this particle was formed by means of the complete compression of the third or first elementary particle. In this respect the theory resembles that of the later PRINCIPIA where the third finite is said to have been formed by the total compression of the first elementary (*Princ.* I, vi, 21-22; viii), and the fourth finite from the total compression of the second elementary of that work (III, iii).

With this general similarity in the mode of formation of the finites referred to, their resemblance practically ends. That they differ in the fact that the one is said to have developed by the growth of a central globule, and the other by means of the reduplication of the surface, has already been shown (Sec. 4).

A far more essential distinction occurs in relation to the nature of the vortical motion of their respective constituent parts. The finites of the published PRINCIPIA have a vortical form, with *polar cones*, and a *conatus* whereby they spontaneously flow into local motion and become actives provided they have the freedom to do so. (*Princ.* I, vi, Appendix, 2; vii, Section on the Actives of the Third Finite, pp. 185-186; viii, 1, 3; III, iii, viii. Compare also I, iii, 15, 21-25.) On the contrary, the fifth particles are said to have no vortical motion, and *no polar cones*; and therefore no *conatus* to local motion is attributed to them, consequently, they cannot become actives. The contrast between the two conceptions is so vital, that I will quote enough from each work to indicate the position taken in it.

In regard to all the finites of the published work Swedenborg says again and again that they are similar, the one to the other, in composition, motion, and form; and he describes them as follows:

A finite which is an aggregate or congeries of parts reduced by motion to a certain situation, does not consist of one surface, layer, and row extending from the center to the outermost surface, but it consists of several; for it is a corpuscle whose individual parts are



similar one to the other, it has a convex figure, but at its opposite ends it has poles gradually widening from the center, and hollowed out into the form of two cones. (*Princ. I, v, Appendix, 2.*)

That in a finite, by reason of the spiral motion and situation of its parts, there arise two poles, one opposite to the other; and that these two poles are formed like cones. (*I, iii, 21.*)

That from the regular disposition of the parts into a spiral figure, arises a general conatus of all, tending to one and the same general motion. That this conatus, if there be nothing extraneous to prevent it, causes a general axillary motion or circumvolution of the finite around its polar axis. (*ib. 22.*)

That from the conatus to motion as exercised by all, there arises [also] a progressive motion of all the parts and spires. (*ib. 23.*)

Therefore not only all the primitive force in the point, but that also which is derived into its sequents, consists in this; that the motion, state, or conatus in a point, tends to a spiral figure. This motion, state, and conatus, cause an axillary, and, at the same time, a progressive motion. These together produce another or a local motion; a motion in which consists the active force of finiting and compounding the sequents; and of modifying them throughout a lengthened series, in the manner in which we perceive, by our senses, the world at large to be modified. (*ib. 24.*)

Such is the sum of our whole work and its principles; and such the cause of all the parts and compositions in our mechanical world. (*ib. I, ii, 22.*)

Compare with the foregoing Swedenborg's statements describing the fifth particle, which is the type of the only distinctive finites in the posthumous work:

The central globule without a surface and inclosed mobile matter, loses its own mobility; nor has it any but what it takes up from the motion of the neighboring particles. . . . It follows consequently, that there is no longer any polar direction; that is to say, *polar cones do not exist in such a particle*, but it is altogether spherical [*rotunda*]. For there is nothing to effect a polar direction; the included matter is wanting, hence also there is no conical aperture toward the poles, nor in any other direction, whence it is merely spherical (*L. P. 59*).

Again, speaking particularly of the eighth particle, he says: Then at last a globule arises which wholly puts off the nature of a vortex, and remains a hard particle, having no such quality as is in the former particles we have been considering, except in those of the fifth kind (*ib. 141*).

As a result apparently of this conception of the finite particles of the LESSER PRINCIPIA, Swedenborg nowhere speaks

of them as actives, and no theory of fire is given.<sup>22</sup> There is no idea of finites forming themselves into new finites, as in the later work, in the case of the formation of second finites from first, and of fifth finites from fourth. Nor of their having any dynamical action upon the particles into whose composition they enter. They are merely passive, and incapable of activity; except by means of surrounding spheres of other particles, even this sort of action is limited as shown in a very striking way in n. 82.

How then do these fifth particles correlate with the particles of the later work? To none as to their intrinsic form.<sup>23</sup> But they do answer in a general way to third finites, in that they are formed around the sun by the compression of the first or universal element; and again, to fourth finites in at least two very important respects: first, in forming a crust around the sun which Swedenborg describes as the "planetary chaos," and the cause of sun spots (*L P.* 86); and, secondly, in forming the bullular surface of the ether particles.

## 26. THE PLANETARY CHAOS.

As respects the incrustation of the sun, we find another general similarity in both treatises, but with variations as in former cases. In the published work, third finites are said to originate in the confines of the sun, (as represented diagrammatically in Plate II, Figure 3), from the compression of first elementaries, and to be woven into second elementaries by the active first and second finites of the sun; forming the permanent sphere of second element around the sun. (*Pl. II, Fig. 4.*) By the compression of this second element, fourth finites are said to

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<sup>22</sup> Swedenborg merely promises an explanation of fire in a paragraph entitled "Appendix on Fire," at the close of the work.

<sup>23</sup> Notwithstanding the difference which has been shown to exist between Swedenborg's conceptions of the form and nature of finites in the two works under consideration, this difference is small as compared with the still

earlier conception of finites published by him in 1721, in *PRODROMUS PRINCIPIORUM RERUM NATURALIUM*, IX, 1. In this work he describes a series of finites, which in number correspond exactly with those of the published *PRINCIPIA*, but they are all bullular in form, and in this respect differ from the finites of both the later works.



arise, and incrust the sun. (Pl. II, Fig. 5.) It is this incrustation of fourth finites which, in this work, Swedenborg calls the planetary chaos out of which the permanent planetary masses are actually formed. (*Princ.* I, viii, 4; ix, 1; x; III, iii, iv.) He describes at length the manner in which this crust was expanded and disrupted by reason of the centrifugal tendency of the vortical motion, and how the planetary globes were formed from it. But note particularly that he says in this work that the ether arose around the planets *after their formation* as such, and that it gradually increased in volume as they receded from the sun, forming the planetary vortices. (*ib.* III, v.)

In the earlier work the stages involved in the formation and compression of the second element do not appear, as already observed. But what is equally striking, the origin of the ether is apparently put prior to that of the planets. (Sec. 8.) On this basis, as may readily be seen, the following stages of the cosmogony must vary considerably.

#### 27. THE SIXTH OR ETHER PARTICLE.

When we reach the ether particles of the two Principias the matter of correlation becomes simple, at least so far as names and general functions are concerned; for we find the sixth or the particles of the second element of the posthumous PRINCIPIA agreeing with the third elementaries or the particles of the third element of the published Principia in the following points:

1. They are both definitely called ether particles.
2. Both are described in a similar way as forming the proper vortices of the planets.
3. Both are said to be the peculiar media of light phenomena.

A great many details might be given showing that the ether of the LESSER PRINCIPIA was conceived of as identical in function with that of the published PRINCIPIA. But as to the details of form, composition, and other things the differences are very great. These differences may be summed up as follows:

1. The ether particle of the later work is spherical in form without polar cones, and in this respect similar to the air

particles of the same work (*Princ.* III, v, 4); whereas the sixth or ether particle of the earlier work is vortical in form with polar cones, and in this respect similar to the first elementary particle of this work (*L. P.* 92, 96.)

2. The particle of the later work is composed of a surface of fourth finites, the interior being occupied by first elementaries (*Princ.* III, v, 2); whereas the particle of the earlier work is composed of a surface of fifth (or compressed first elementary particles), the interior space being occupied by the active points precisely, as in the case of the third particle (*L. P.* 89). The posthumous work it will be noticed makes a far less discreet distinction between the ether and first elementary particles than does the published work.

3. The particle of the earlier work is said to have a sphere of active points around it as in the case of the third particle; whereas no sphere of the same character is mentioned in the later work. This sphere around the ether particle, however, is said to maintain itself with greater difficulty, than the sphere around the third particle. (*L. P.* 95.)

4. When the particle of the later work is compressed the fourth finites from its surface are formed into a number of bullular spherules, each containing first element in its interior (*Princ.* III, v, 19); whereas the surface of the ether particle of the earlier work is formed into a single hard central globule, as in the case of the third particle (*L. P.* 138-139).

5. The fully compressed ether particle of the published work is said to form a finite similar to the water particle, but which Swedenborg no further identifies (*Princ.* III, v, 19; vii, 11); whereas the fully compressed ether particle of the posthumous work becomes a finite—the eighth particle—in all respects similar to the fifth particle of the same work, and performing the functions of the fifth finite of the later work, at least in the composition of the air and water particles. (*Cf.* Sec. 11, 30, 31, 32.)

## 28. THE TELLURIAN VORTEX.

The general characteristics of the tellurian vortex described in sections 8-9 are similar to those presented in the published work, especially in the following respects:



1. In both cases the ether forms the distinctive element of the vortex.

2. In both cases more subtle particles are present and conspire to the formation of the vortex. Thus in the later work the first and second elements and also the actives of the point are all present throughout the ether and perform their peculiar functions in the vortex; (*Princ.* III, vii, intro.; II, viii, 1; xv, 2; III, xi, 5; I, v, app.); while in the earlier work the fourth or partially compressed first elementary particles and the active points or attenuated matter are said to be present (*L. P.* 94, 100-101, 108, 111, 113).

3. In both case a vortical flow is described. (*L. P.* 106-107; *Princ.* III, xi, 5.)

In some respects it is rather difficult to form a clear conception of Swedenborg's idea of the actual nature of the vortex in each case, but there are several points of difference worthy of notice:

1. In the earlier work the tellurian vortex is said to have been formed before the primitive globe of the earth. In the later work the reverse is the case; it is here said that the globe was formed before the vortex. (Sec. 6, 8-12. Cf. *Princ.* III, iv and v.)

2. In regard to the origin of the vortical motion: the theory of the LESSER PRINCIPIA, which would make the vortex and therefore the earth itself rotate in the opposite direction from which they actually do, is not set forth in the published work. In the latter work the vortical motion is attributed rather to the intrinsic conatus toward such motion latent in the particles of the several elements which compose the vortex. The principle of the published work is that the tendency of the particles is such that all that is necessary is that there be a nucleus or center, such as a tellurian globe, itself having an interior conatus impelling it into axillary motion,<sup>24</sup> which may determine the organization of such a vortex. In addition to this the vortical motion seems to be attributed to the activity of those particles of the higher elements which are within the tellurian

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<sup>24</sup> Cf. *Princ.* III, v, intro.

vortex rather than to those which are outside of it. (*Princ.* III, xi, 5; II, i, 1.)

**29. SEVENTH OR PARTIALLY COMPRESSED ETHER PARTICLES OF THE TELLURIAN VORTEX.**

'The seventh, like the fourth particles which they correspond to, do not constitute a distinct or discreet element or atmosphere. They are simply partially compressed ether particles, which have not yet lost anything of their elementary quality. They correspond to the partially compressed ether particles of the published *PRINCIPIA*, though they differ from the latter in composition and form. These seventh particles may be described as ether particles such as they exist under the pressure conditions of the tellurian vortex. (See sec. 10.)

**30. THE EIGHTH PARTICLE.**

The eighth particle corresponds in one essential function to the fifth finite of the published work; namely, in the composition of the air. The surface of the air particle in the later work is said to be composed of fifth finites, in the same manner as the surface of the air particle in the earlier work is said to be composed of eighth particles. But the eighth particle differs from the fifth finite in several essential respects when we come to consider its origin, form, and nature:

1. Fifth finites are said to have arisen from the motion of fourth finites among themselves at the surface of the primitive globe of fourth finites, in a manner similar to that in which second finites arose from first; thus, not from the compression of any elementary particle (*Princ.* III, iii, 6; I, iv, 3-6). Whereas, the eighth particles are said to have been formed by the compression of the ether particle (sec. 11).

2. Fifth finites are said to have arisen after the permanent globe of the earth, as illustrated in Plate II, Figure 9 (*Princ.* III, vi); whereas the eighth particles are said to have arisen at the center of the ether vortex before any planetary globe had been formed. (*L. P.* 141, 142.)

3. In form and activity the two kinds of particles are altogether different. Fifth finites are vortical in form and capable of becoming actives (*Princ.* III, viii, 1-4); whereas the eighth particles are said to put off entirely the vortical character and



remain hard particles incapable of activity (*L. P.* 141). This difference has already been discussed in Section 25 on the Fifth Particle.

### 31. THE NINTH OR AIR PARTICLE.

The air particles of both works are identical in function, and correspond more closely in form than any of the preceding series of entities. The following are some of the points of agreement:

1. The air particles of both works are spherical in form, without polar cones. (*L. P.* 143, 145; *Princ.* III, vii, intro.)

2. In both cases the interior is occupied by elementary particles.

3. In both cases the particles are shown to be elastic, and the phenomena of expansion and compression are similarly explained. (*L. P.* 156, 149, 151, 147, 160; *Princ.* III, vii, 5, 9, 11.)

4. In both cases there is a very striking resemblance in the fact that during compression, the surface matter is said to be formed into spherules in the interior cavity of the particles. (*L. P.* 147; *Princ.* III, vii, 11.) This resemblance becomes very evident on comparing Figure 94 of the posthumous *PRINCIPIA* with Figure 108 of the published work.

5. In both cases the water particle arises from the compression of the air particle. (See below, sec. 32.)

6. In both cases the air is described as the peculiar medium of sound. (*L. P.* 154-159; *Princ.* I, vi, 38; *ib.* III, vii, 15, 17.)

The two works differ as to the origin and components of the air particle; as follows:

1. The air particles of the published work are said to arise around the surface of the planetary globe of fourth finites as represented in Plate II, Figure 10 (*Princ.* III, vii, intro., 1); whereas those of the posthumous work are said to have arisen before the permanent planetary globe had come into existence (sec. 12). At this stage of the cosmogony, therefore, the *LESSER PRINCIPIA* assumes that the planetary vortex consisted simply of the two atmospheres—the ether and the air,—without any planet in their midst. Swedenborg says:

"In the beginning of things, as was said, the atmosphere or particles of the ninth kind could extend even to the center of the earth, and consequently have an altitude of 500 to 600 Swedish miles,<sup>25</sup> this being the measure of the semidiameter of the earth." (*L. P.* 160.)

It is to this great column of air that Swedenborg attributes the tremendous pressure which was able to convert air particles into water particles at this early stage.

2. The interior cavity of the air particle of the published work is said to be occupied by two kinds of elementaries—the first and the second of that work (*Princ.* III, vii, intro.); whereas the interior cavity of the corresponding particle of the posthumous work is said to be occupied by one kind, namely, the partially compressed first elementaries or fourth particles (*L. P.* 143).

### 32. THE TENTH OR WATER PARTICLE.

The water particles of the two *PRINCIPIAS* correspond very closely, in that

1. Both are said to arise from the compression of the air particle. (*L. P.* 160, 161; *Princ.* III, ix, 1.)

2. Both are similarly constituted, having their interiors filled with spherules, as illustrated by Swedenborg in Figure 98 of the posthumous work, and in Figure 110 of the published work.<sup>26</sup>

3. Both are described as hard, inexpandible and incompressible. (*L. P.* 161, 162; *Princ.* III, ix.)

4. In both cases the particles depend for their fluidity upon interfluent ethereal and higher elementary particles. (*L. P.* 166; *Princ.* III, ix, 2.)

The only notable difference between these particles is that in the published work they are said to have arisen around the

<sup>25</sup> A Swedish mile is equivalent to 11,700 yards, or 6.65 miles.

<sup>26</sup> It ought to be noted that the water particle on the basis of which the whole of Swedenborg's *CHEMISTRY OR PRODROMUS PRINCIPIORUM RERUM NATURALIUM* is built up is entirely different from that of the later works. The water

particle of the *CHEMISTRY* resembles more closely the elementary particle of the later works, consisting, as it does, of a surface composed of "crustals," and an interior cavity occupied by subtile igneous or ethereal matter. (*Chemistry*, IX, 1.)



planetary globe, as represented in Plate II, Figure 11 (*Princ.* III, vii, 1); whereas in the earlier work they are said to have been formed in the very center of the tellurian system, and thus themselves to have given rise to the primitive planetary globe (see following section).

### 33. THE PRIMEVAL OCEAN.

Swedenborg's conception of the depth of the primeval ocean is quite different in the two works. According to the published work the water in the beginning simply enveloped the earth, as represented in Plate II, Figure 11, (*Princ.* III, vii, 1); whereas according to the posthumous work the depth of the ocean at its first creation extended to the center of the earth, or, in other words, the globe was nothing but water or ocean<sup>27</sup> (*L. P.* 163-164).

### 34. THE SUBSTRATUM AND CRUST.

Practically nothing is said in either work of what is now known to geology of the marvelous history of the earth's crust. Swedenborg simply touches upon his theory of the origin of the primitive saline and earthy matter as presented in his earlier work on Chemistry. He nowhere refers to the CHEMISTRY in these works, but there is nothing to indicate that he had modified the opinions expressed there. There is however one point about which we are left in doubt. In the published PRINCIPIA Swedenborg describes the incrustation of the primeval ocean by primitive earthy matter, as represented in Plate II, Figure 12, but he does not refer to any substratum of denser matter at the bottom of the ocean; as seems to be the case both in the CHEMISTRY and the LESSER PRINCIPIA. Miss Lillian G. Beekman in her work on "Swedenborg's Cosmology" evidently takes it for granted that Swedenborg held consistently to his early idea that a substratum of rock salt was first formed (Chap. VII); but there is a question whether, when he wrote the third work, Swedenborg did not

<sup>27</sup> The same idea seems to run through Swedenborg's earlier works, as appears, for instance, in the MISCELLANEOUS OBSERVATIONS, published in 1722. See the chapter "On the Primeval Matter of the Earth, with reasons for conjecturing that it was water."

realize a difficulty in the idea that salt should be precipitated under conditions where it would seem impossible for it to reach saturation.

### 35. THE ELEVENTH OR VAPOR PARTICLE.

The vapor particles of both the posthumous and the published *PRINCIPIAS* are practically identical.

1. Both are bullular in structure.
2. The surface of each is said to be composed of water particles.
3. The interior space of each is said to be occupied by ether. In the case of the particle of the *LESSER PRINCIPIA* a higher element is also said to be present; but the same may be implied in the case of the particle of the later work, though not specifically stated.

### CONCLUSION.

36. It seems very evident from the facts presented that the only reasonable correlation that can be made between these two systems is a very general one, based on corresponding uses. That in so far as their essential uses are concerned a number of the particles can be definitely correlated; but that beyond this the identification ceases in most cases, and the more so as we descend into the details of composition, and form. Looked at in their broader aspect, the two systems present the same distinctive principles; but in each case these principles are worked out in a somewhat different manner.

We seem forced to the conclusion that Swedenborg's cosmological ideas developed considerably after he wrote the draft of the *LESSER PRINCIPIA*, and that the later published work embodies the results of further study, especially into the details of his system, incorporating considerable modifications in the working out of these details. If this conclusion is correct it has a very important bearing in relation to the theories presented in his earlier works.

We append a table indicating in parallel columns all the particles of each *PRINCIPIA*, in the order of their formation, aligning those that correspond in function, and printing in black letters those whose uses correspond in the most essential respects:



# CORRELATION OF THE PARTICLES OF THE TWO PRINCIPIAS ON THE BASIS OF THEIR RESPECTIVE USES.

## EARLIER PRINCIPIA.

1. **First Particle.**
2. **Second Particle.**  
  
[Second Particle.]<sup>29</sup>  
[First Particle.]
3. **Third Particle.**
4. **Fourth Particle.**  
  
[Fifth Particle.]  
  
[Fourth Particle.]
5. [Fifth Particle.]
6. **Sixth or Ether Particle.**
7. **Seventh Particle.**
8. **Eighth Particle.**
9. **Ninth or Air Particle.**
10. **Tenth or Water Particle.**
11. **Eleventh or Vapor Particle.**

## PUBLISHED PRINCIPIA.

- First Natural Point.**
- First Natural Point Active.**
- First Finite,<sup>28</sup>
- First Finite Active.
- Second Finite.
- Second Finite Active.
- First Elementary Particle.**
- [First Elementary partially compressed.]
- Third Finite.
- [Third Finite Active.]<sup>30</sup>
- Second Elementary Particle.
- Fourth Finite.
- Fourth Finite Active.
- Third Elementary or Ether Particle.**
- [Ether Particle partially compressed.]
- [Finite from compression of Ether Particle.]<sup>31</sup>
- Fifth Finite.**
- Fifth Finite Active.
- Fourth Elementary or Air Particle.**
- Water Particle.**
- Vapor Particle.**

<sup>28</sup> In the case of the first finite, the actives of the second, third, fourth, and fifth finites, and the finite resulting from the compression of the ether, there are no corresponding particles in the earlier *PRINCIPIA*.

<sup>29</sup> Although the second particle in its most essential respects corresponds to the active first natural point of the published *PRINCIPIA*, as indicated by the black

lettering, still it is made to perform some of the functions of the Active first finites. For this reason it is repeated in brackets. The same principle applies in other similar cases.

<sup>30</sup> Swedenborg says that none of these have a chance to become actives.

<sup>31</sup> Use unidentified by Swedenborg.





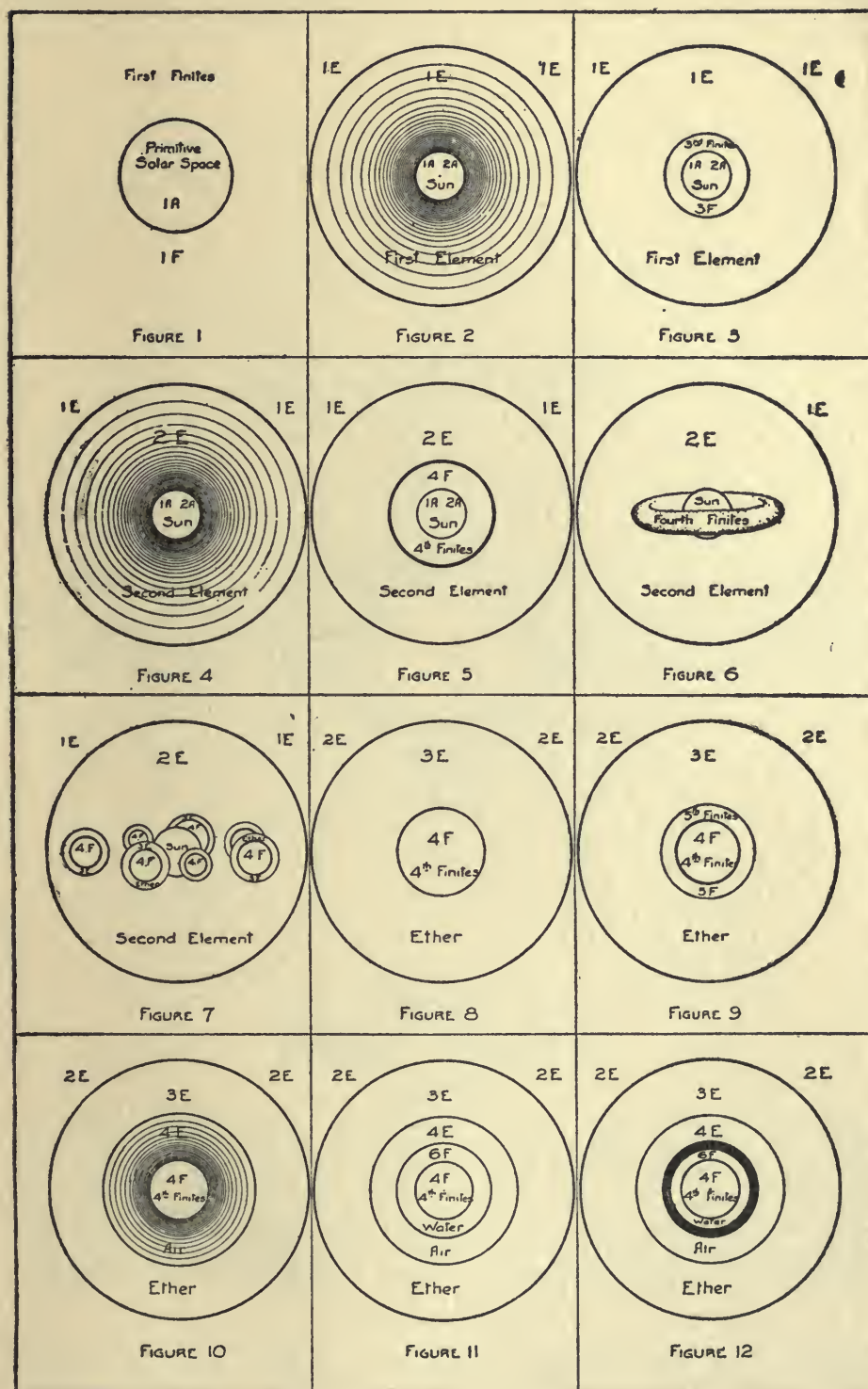
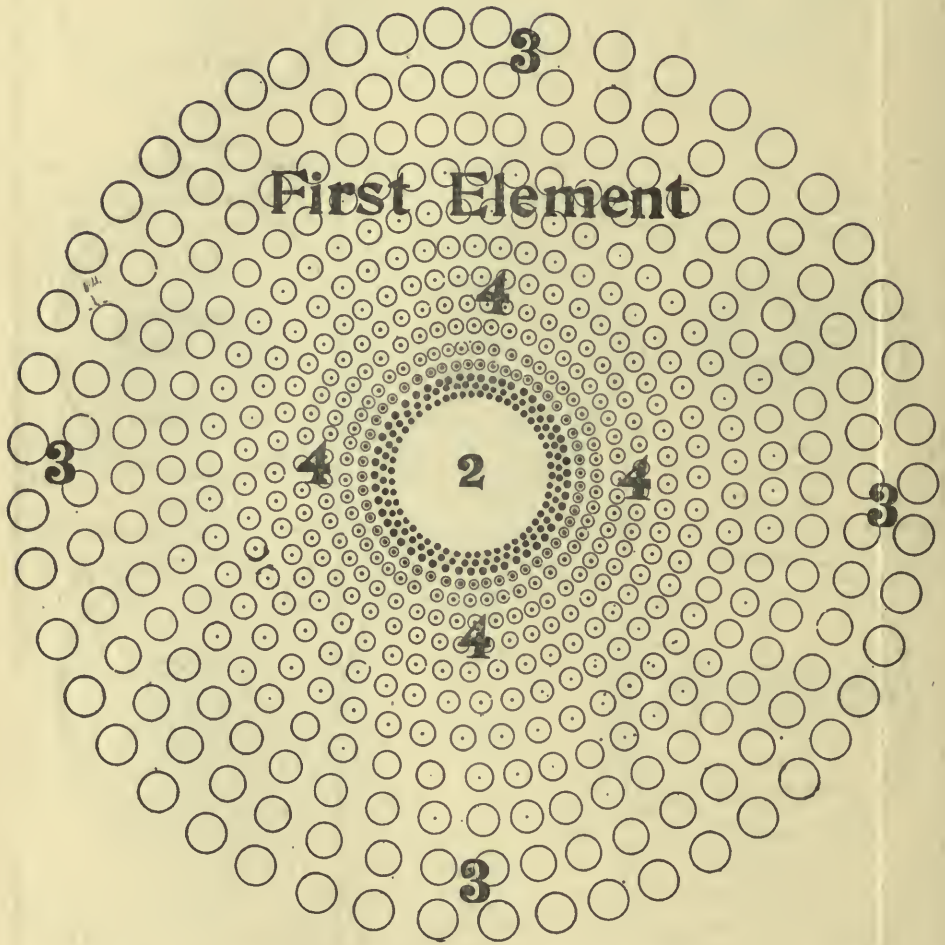
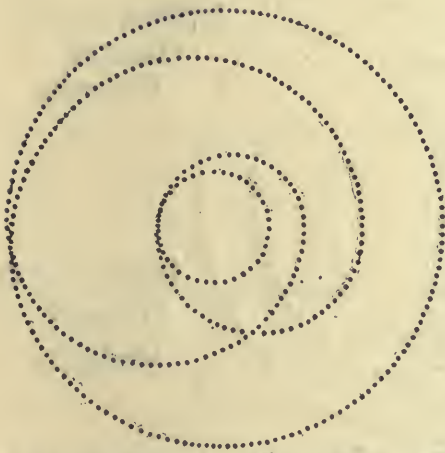


PLATE II. A diagrammatic representation of the successive stages of the Cosmogony of the published Principia. Figures 1-7: Stages in the development of the Solar Vortex. Figures 8-12: Stages in the development of the Tellurian Vortex. 1E, 2E, 3E, and 4E symbolize first, second, third, and fourth elementaries respectively; 1F, 2F, 3F, 4F, etc., the several degrees of finities; 1A, 2A, first and second actives. The solid black ring in Figure 12 represents the earthy crust formed around the water.

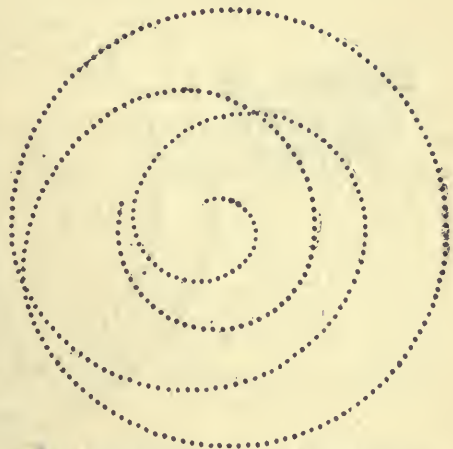


PLAT III. A more detailed diagram representing the compression of the first element of the Lesser Principia around the sun, at the stage shown in Plate I, Figure 4. 2,—The active Solar Space consisting of active points or particles of the second kind. 3, 3, 3,—Uncompressed third particles of the first element. 4, 4, 4, 4,—Fourth or partially compressed third particles, which are smaller the nearer they are to the active sun, and which contain central globules increasing in size according to the degree of compression. The solid black dots represent fifth or fully compressed third particles forming a crust immediately around the sun where the compression is greatest.





**1. Internal Motion of  
Quiescent Point or  
First Particle.**



**2. Internal Motion  
of Fluent Point or  
Second Particle.**

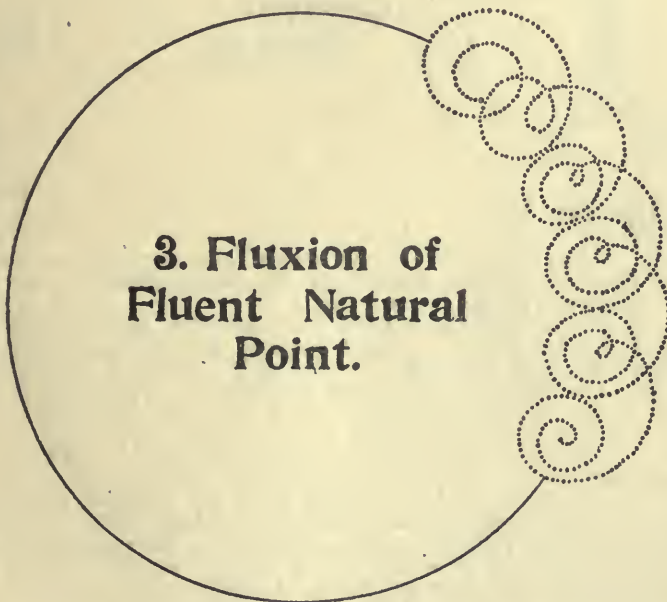


PLATE IV. A reproduction of Swedenborg's diagrams in the Lesser Principia, illustrating the difference between the internal motions of the two kinds of First Natural Points (Fig. 1 and 2); and the local motion of the active or Fluent Natural Point (Fig. 3).

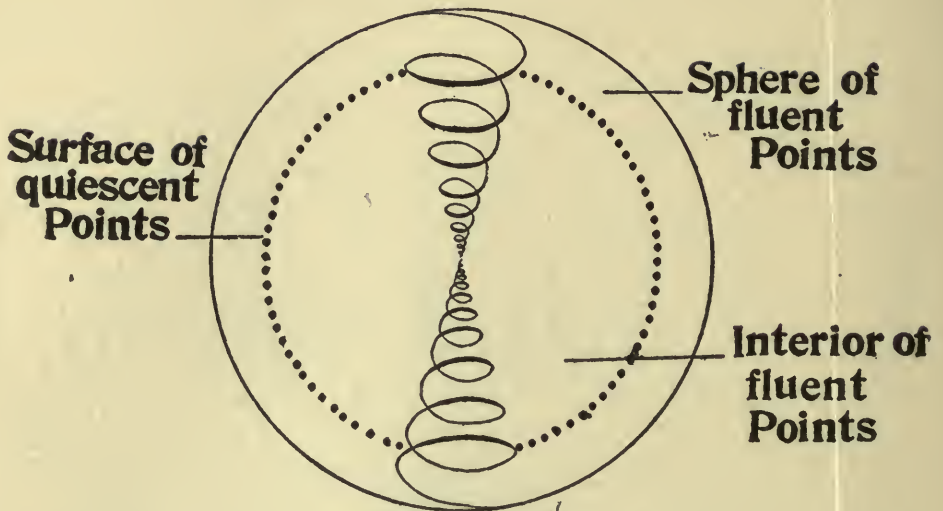


Figure 1.

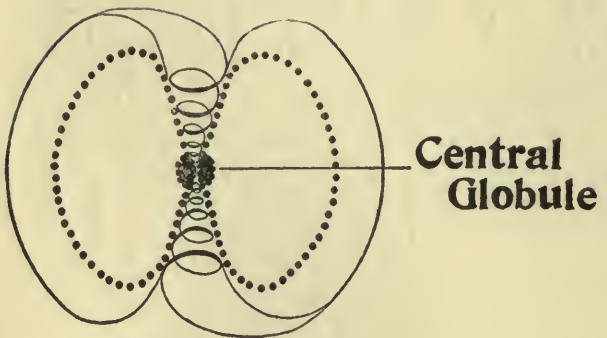


Figure 2.

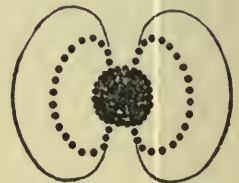


Figure 3.

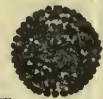


Figure 4.

PLATE V. A representation of the general structure and composition of the Third, or First Elementary, Particle of the Lesser Principia, and the changes which it undergoes during compression.

Figure 1. The uncompressed Third Particle. The conical spirals indicate the motion of the fluent points or second particles through the polar cones, the motion being in the same direction in respect to the center at each pole.

Figure 2. The same particle partly compressed, showing the entrance of the superficial matter through the polar cones and the formation of the central globule.

Figure 3. The same particle still further compressed, showing the growth of the central globule.

Figure 4. The Fifth Particle, arising from the complete compression of the third particle. As indicated the original superficial matter is completely absorbed by the central globule so that no interior active space remains.

N. B.—Represented more accurately the exterior sphere ought to be relatively larger and larger according to the degree of compression. The fifth particle itself is also said to have a sphere, but does not easily retain it.

The same series of diagrams also illustrate the structure and compression of the Sixth or Ether Particle of the Lesser Principia, the sole difference being that in the case of the Ether Particle the surface consists of fifth particle instead of quiescent points, and the order of magnitude is greater.



## A CORRELATION OF THE TWO PRINCIPIAS ON THE BASIS OF STRUCTURE.

BY E. E. IUNGERICH.

Mr. Brown, in his table, correlates the particles of the two *PRINCIPIAS* according to the names and uses assigned them by Swedenborg. This, however, puts, in several cases, entities side by side whose structures are so dissimilar that no agreement can possibly be expected. The condition would then follow that Swedenborg must have laid aside the theory of the *LESSER PRINCIPIA* as untenable, before he presented that of the published *PRINCIPIA*.

I would suggest, as preferable, a correlation as to structures. This would make the following changes in Mr. Brown's table of correlation: (a) The sixth or ether particle, which has hollow polar cones, should not be correlated with the third elementary or ether particle which has a continuous spherical surface, but with the second elementary particle. (b) The eighth particle which results from compression of the sixth, or the second hollow polar cone particle mentioned in the *LESSER PRINCIPIA*, should be correlated with the fourth finite, the result of compression of the second elementary, the second polar cone particle mentioned in the published *PRINCIPIA*. But the eighth particle should also be aligned with the fifth finite, as Mr. Brown has it. (c) The ninth or air particle, which is the first one with a smooth spherical surface mentioned in the *LESSER PRINCIPIA*, should also be aligned with the third elementary; it also remaining where Mr. Brown has placed it. (d) The tenth or water particle should also be aligned with the finite from compression or ether particle. (e) I regard the resemblance of the Second and First particles with the First Finite Active and the Second Finite as much closer than their resemblance to the First Natural Point and its Active. (f) The First particle is also identifiable with the First Finite.

The substitute table of correlation I propose is therefore as follows:

## EARLIER PRINCIPIA.

**Natural Point.**

1. First Particle.
2. Second Particle.
- 1a. [First Particle.]
- 2a. [Second Particle.]
3. **Third Particle.**
4. Fourth Particle.
5. Fifth Particle.
6. **Sixth or Ether Particle.**
7. Seventh Particle.
8. **Eighth Particle.**
- 9a. [Ninth or Air Particle.]
- 10a. [Tenth or Water Particle.]
- 8a. [Eighth Particle.]
9. **Ninth or Air Particle.**
10. **Tenth or Water Particle.**
11. **Eleventh or Vapor Particle.**

## PUBLISHED PRINCIPIA.

**First Natural Point.****First Natural Point Active.**

- First Finite.
- First Finite Active.
- Second Finite.
- Second Finite Active.
- First Elementary Particle.**
- [First Elementary partially compressed.]
- Third Finite.
- [Third Finite Active.]
- Second Elementary Particle.**
- The same partially compressed.
- Fourth Finite.**
- Fourth Finite Active.
- Third Elementary or Ether Particle.
- Ether Particle compressed till no longer elementary (Prin., vol. 2, p. 295).
- Fifth Finite.
- Fifth Finite Active.
- Fourth Elementary or Air Particle.**
- Water Particle.**
- Vapor Particle.**

A. In the published *PRINCIPIA* two methods of forming derivative finites are given: 1. By the Composition of various finites in the path of flow of a given finite until they touch each other. Their aggregate is then considered as a new finite. In this way the First Finite was made from the Natural Point, the Second Finite was made from the First, and the Fifth from the Fourth. 2. By the Compression of a hollow polar cone elementary to a solid. In this way the Third Finite was made from the First Elementary, and the Fourth Finite from the Second Elementary. In the Posthumous or *LESSER PRINCIPIA*, the method of composition is entirely lacking. Swedenborg apparently had as yet no conception of it.

The first step in the correlation I am suggesting, is that we read into the cosmogony of the *LESSER PRINCIPIA* this principle of composition. In other words, we are to consider three of the entities there under two aspects, 1. as uncompounded,



and 2. as having undergone the process of composition. There is nothing unreasonable and unwarrantable about this, for if the posthumous *PRINCIPIA* is to be regarded as a preliminary blocking out of what was finished in the published *Principia*, it is evident that we must give a wider latitude to various entities in the former and assume that one of these may include several of those mentioned in the latter.

It is notable in the *LESSER PRINCIPIA* that the author speaks for several pages about the Natural Point and its properties before any mention is made of the First and Second Particles, and that directly the latter are mentioned they are described as forming what corresponds to the First Elementary. I conclude that Swedenborg really had the First Finite and its Active in his mind when he described the First and Second Particle, although he had not as yet conceived the method of composition by which the Natural Point becomes First Finite. That the First Particle and the Second Particle are not correlate with the Natural Point and its Active is further evident from the fact that the conception of the Active of the Point was, as it were, an afterthought added to the published *PRINCIPIA* and the *ARGUMENTA* because of the analogy with the First Finite Active which had been previously formulated.

The First Particle can be looked at simply, or as undergoing the process of composition. I have represented both aspects in my table as 1 and 1a. In the second case it is correlate with the Second Finite. Similarly the Second Particle can be regarded as involving, when compounded, the Second Active.

Pass now to the Eighth Particle. It has the same two aspects, 8 and 8a, correlate respectively with the Fourth and Fifth Finites.

Now the Fourth and Fifth Finites when molded about volumes of the first two elementaries make the terrestrial ether and air. The elementary particle, the Ninth which is to be formed from the Eighth, should therefore yield us two elementaries, viz., the terrestrial ether when the Eighth is taken simply, and the air when the Eighth is regarded as compounded. This causes me to assign two aspects to the Ninth

particle, 9 and 9a. Accordingly the Tenth which is the non-elastic solid formed by compression of the Ninth should be taken in two aspects, viz., as water and as the solid formed from ether which Swedenborg mentions but does not describe further.

B. I consider these suggestions as simplifying somewhat the problem before us, to see the identification of the two PRINCIPIAS. There yet remain two hard nuts to crack. 1. I raised as an objection to Mr. Brown's alignment that he aligned in several cases entities of totally unsimilar and unequal structures. This difficulty has been overcome in my alignment; but in its place I have added the difficulty of disregarding the title and property assigned to the Sixth Particle. Swedenborg calls it the terrestrial ether, and I have deliberately identified it with its structural analogue, the Second Elementary. 2. This Sixth Particle, called Ether, in the LESSER PRINCIPIA, as Mr. Brown shows, is presented as antedating the solid Fourth Finite which the published PRINCIPIA says formed the core of our globe. The LESSER PRINCIPIA speaks of our earth as having been first a gaseous volume of Sixth Particles, and only later was there a core formed by its compression. The published PRINCIPIA speaks of the solid cores as having been the first of our earthly vortex, and that the atmospheres were formed by volatilizations of portions of the core and the molding of these into elementaries. (Compare Plate I, Fig. 6, with Plate II, Fig. 7.)

On these two points, I can offer only a suggestion.

In regard to the first point, I may say that the Sixth Particle is the only one in which I have disregarded the title assigned by Swedenborg. Yet by taking it to mean what that title implies, Mr. Brown is forced to align it with an elementary which is not a hollow polar cone elementary.

My suggestion, and I put it forth very tentatively, is that Swedenborg, in calling it the terrestrial ether, is to be taken to mean that it is that portion of the magnetic or second elementary which is in the earth's vortex, interstitial between the real ether particles. The further discrimination between the Sixth Particle and the Seventh, or the former under a state



of compression, I regard as showing that the Seventh is in reality that part of the magnetic or second elementary in the earth vortex; whereas the Sixth is the Second Elementary *per se* which forms the solar vortex. An additional suggestion as to the uses of the partially compressed particles, 4 and 7, fits in here. The volume consisting of Third Particles I consider to be the universal aura. The volume consisting of Fourth Particles I would regard as a volume of universal aura particles within the field of a solar system, delineating and marking out before the existence of the second aura the sphere in which it was subsequently to flow. The volume consisting of Seventh Particles I would regard as a volume of second elementaries within the range of a planetary vortex, delineating and marking out before the existence of the terrestrial ether the sphere in which it was subsequently to flow.

In regard to the second point of difficulty, I regard the condition portrayed by Plate I, Figure 6, as indicating a state prior to that represented in Plate II, Figure 7. Namely, it is the state before the throwing out of the real second elementary. Between Plate I, Figure 6, and Plate II, Figure 7, there existed the process in which the second elementary was thrown out to fill the solar vortex, and the stage of a compression around the sun to form the true cores for planetary material.

I advance these suggestions with diffidence knowing that, owing to my imperfect grasp, flaws can be found in my exposition of these ideas, but with a feeling that the agreement of the two PRINCIPIAS will eventually be found along this line of correlation.

## THE CORRELATION OF SWEDENBORG'S PHILOSOPHY AND THEOLOGY.

BY GEORGE W. WORCESTER.

In his excellent translation of Swedenborg's *DE GRADIBUS FORMARUM* which has appeared in the *NEW PHILOSOPHY* for October, 1912, Mr. Acton has rendered most valuable and timely service to students of Swedenborg's Philosophy and Theology,—I feel that I am not overstating the matter when I assert that this translation is the most important philosophical contribution to the Church since Prof. Tafel's two volumes on the *BRAIN*. The original Latin of this treatise is extremely difficult in places, owing to the intricacies of thought therein contained, and the Church is to be congratulated in possessing one so thoroughly capable as Mr. Acton of rendering in clear and concise English the involved sentences of the Latin, with no loss to the original thought of the Author.

The appearance of this translation, which ought to become widely circulated and studied among students of Swedenborg, opens up for our consideration the whole subject of the correlation of Swedenborg's philosophy and theology—and it shall be the aim of this paper to discuss this question, basing all conclusions, not upon some pet theories of my own, but wholly on statements and assertions of Swedenborg himself.

The trichotomy of Swedenborg's Science, Philosophy and Theology was formulated and developed by means of certain universal doctrines or subsidiary sciences, apparently received *a priori* by him,—a knowledge of which he again and again asserts is absolutely necessary for a deeper and more interior understanding of his Theological Writings. He has designated these doctrines as Series and Degrees, Forms, Modifications, Representations, Correspondences, Influx and Order. They are intimately interrelated or anastomosed, one with another, and, therefore, a knowledge of all is necessary before any one can be thoroughly understood. He has left an extended exposition of only two of them—that of Series and Degrees, in his "Introduction to Rational Psychology," in the second vol-



ume of the ECONOMY OF THE ANIMAL KINGDOM, and that of Forms, which Mr. Acton has just contributed in English in connection with his translation of the treatise on the FIBRE, of which DE GRADIBUS FORMARUM is a part. In both of these expositions, however, Swedenborg assumes a prerequisite knowledge of the other sciences on the part of the reader. The HIEROGLYPHIC KEY is a partial setting forth of the doctrines of Representations and Correspondences; and scattered throughout his Scientific and Philosophic Writings are partial explanations of the others.

In proof of the importance Swedenborg attached to these subsidiary doctrines, we find assertions like the following scattered throughout his Writings:

These things can not be understood except by means of new doctrines, namely, the doctrine of Forms, Order and Degrees, Influxes, Correspondences and Modifications, where all things are explained (*Senses* 489).

Again we read in his treatise, DE CEREBRO, in the PHOTO-LITHOGRAPHED MANUSCRIPTS:

We labor in vain to obtain a knowledge of the mind and of the soul, unless we distribute the Animal Kingdom into its degrees, and view one degree above another. \* \* \* When the existence of degrees in the world and its kingdoms is granted, and we distribute all things into order according to degrees, it will be seen to a certain extent what the external man is and what the internal . . . ; what the imperfect animal is and what the perfect and the most perfect or rational; what the soul is, what the mind, what the animus,—the merely corporeal state; what substance is, what the substantiate, what the material, what the immaterial; where the physical ends and the physiological begins and, finally, the physiologico-moral, and many other things (*De Cerebro*, n. 265; in 4 *Phot. MSS.*, pp. 179, 182).

In the treatise of which the foregoing is an excerpt, he dwells, at great length, upon this whole matter,—even considering the relation of Philosophy to theology and he strongly insists upon a systematic and exhaustive course of study as the only means of attaining a rational comprehension of these matters—closing with the following passage:

Thus and no otherwise, as I believe, is open the way to psychology and to a true knowledge of the essence of our soul and mind. These matters, although they seem to be the labor of ages, can yet, within a short time, so come to the understanding, that what is true may be acknowledged, and what is false recognized (*Ibid.*, in 4 Phot. MSS., p. 182).

If, then, we are to take Swedenborg's assertions seriously,—and many even stronger statements are at hand,—to take it that he meant exactly what he said, when he is so very insistent upon a prerequisite knowledge of these subsidiary sciences,—is it not very strange that to-day, more than one hundred and forty years after his death, scarcely any serious effort has been made to heed his warnings and advice! Concerning this matter one of our most prominent ministers has thus expressed himself to me: "New Church people have such an aggravating way of saying that we can solve all problems. We *can't*, at least we *don't*. I feel my limitations more and more and, at the same time, I think I have a deeper appreciation than ever before of the essential value of a study and knowledge of Swedenborg's Scientific Works, *in the order in which he pursued them*. The truth is, we are being driven to it. I have felt for some time, that we are at a disadvantage in presenting the doctrine of Correspondences, because we have presented it as a doctrine of *theology*, whereas it was something which Swedenborg, by his doctrines of Series, Forms, etc., worked out as a *scientist*."

We have been accustomed to regard the doctrine of Series and Degrees as the most important and comprehensive of these subsidiary sciences. When segregated from the other sciences, however, the science of Series and Degrees merely postulates a course of progress through essentially different and distinct stages of discontinuity thus briefly formulated by Swedenborg: "In nature there is nothing except what is discontinuous." (4 *Ad.* 2538.) Hence while positing discrete stages of progress, Series and Degrees does not attempt to explain how activities obtaining in a lower series become, so to speak, organically discontinuously continued in the next successive. To give a concrete example—the doctrine of Degrees postulates the discreteness of the visual sense percept



and the thought and act of the will thence arising. It does not, however, explain the physiological and psychological processes obtaining within the cerebrum and the cerebral cortex whereby the visual perception becomes modified and eventually gives rise to rational thought and to the voluntary act of the will. To explain these changes and modifications is primarily the function of the doctrine of Forms and its concomitant doctrine of Modification. In a similar manner it could still further be shown that the doctrine of Correspondences, as well as the other subsidiary doctrines, is dependent upon the doctrine of Forms. The importance of a rational understanding of the doctrine of Forms is at once apparent.

In his introduction to his translation, Mr. Acton has truly said that the "doctrine of Forms is in reality the doctrine of the human form." For my own part, I should extend that thought somewhat further and assert, that in those concepts of Forms set forth and applied in *DE CULTU ET AMORE DEI*, especially in Part III, the natural rational or philosophic degree of Swedenborg's mind had attained its most sublime height of perfection—for, not long after the publication of this work, he made the following note of his own spiritual progress: "There is a change of state in me, into the Celestial Kingdom." (*Index Biblicus*. *Isaiae*, p. 1.) His intromission into the Spiritual World at this time, with the philosophical degree of his mind trained and perfected, was necessary and orderly, in order that he might thereby utilize his philosophical concept of Forms—the result of his scientific and philosophical training—as the matrix or natural continent for the reception and transmission of his spiritual concept of Forms, the Divine Humanity of the Lord,—taught to him, as he himself tells us, by the Lord alone. The doctrine of Forms, then, enables us to arrive at a rational understanding of the exact place Swedenborg filled as an instrument in the Second Coming of the Lord, and also of how his philosophy and theology are correlated.

The doctrine of Forms, then, is essentially and primarily the Divinely given doctrine of Creation and Evolution, clothed and formulated in terms of and by means of the doctrine of

Degrees. Hence it explains the whole *raison d'être* of Creation—the origin, evolution and perpetuation of life, as also the psychological development of the mind, etc. But the concept of Form is so closely and intimately interrelated with that of Substance and that of Motion that we can conceive of no substance without Form, no form without Substance and neither substance nor form without a concomitant concept of Motion. Form in its ontological signification implies Conatus or effort, and, in a certain sense, the *desire* of that which is higher in its essential nature to clothe itself with that which is lower in degree. It is, therefore, inseparably associated with motion or life. Hence whenever activities obtaining within the essential substances of a higher degree meet with the re-active or passive activities obtaining within the essential substances of a lower degree they become, as it were, clothed, and the resulting combination is termed *Figure*. Figure is, then, the arrested or modified motion of the substances of the higher *Form*—it is the external of which Form is the *Internal*.

Concerning this matter Swedenborg says:

Motion is a certain perpetual *Conatus*, which is being continued; for, as soon as the Conatus recedes Motion is arrested. So action is a certain perpetual will; for as soon as will recedes action is arrested. Action, then, is continued will.

Will is a certain Conatus of activity, but the determination itself takes place by means of a kind of motion in the organic beginnings of the cerebrum, namely, by means of expansions and contractions. These organic beginnings are the subtlest parts in the very cortex of the cerebrum. . . . Thence are determined into act changes of state which are variations of form (1 *Ad.* 989-990).

Time will not permit an extended elaboration of the foregoing concepts, which, were it possible to do, would furnish the most sublime philosophical explanation of creation. In the Spiritual Form, as set forth in No. 267 of MR. ACTON'S translation will be recognized the Infinite *Figure* of Divine Substance—that most wonderful and glorious philosophical deduction of Swedenborg's Divinely prepared and trained natural rational mind—his highest philosophical concept of the Lord's Divine Humanity—a spiritual understanding of which rendered his intromission into the spiritual world necessary.



When explaining the intercourse of the soul and the body, Swedenborg has given three hypotheses—that of Physical Influx, that of Pre-established Harmony and finally that of Spiritual Influx—which last named he has postulated as the only tenable one. When viewed in the light of the doctrine of Forms, the inflow of the spiritual activities of the soul down into the body,—giving life to the lifeless activities obtaining within the body, whereby one plane after another of the mind is developed and perfected—is most clearly and rationally evident. In like manner it could be shown by means of the doctrine of Forms, most forcibly and clearly, how necessary it is for the New Church student of the History of Philosophy to be thoroughly grounded in the science and philosophy of Swedenborg before undertaking such studies. For just as the spiritual activities of the soul give life to the body, so will the spiritual activities resulting from a rational understanding of Swedenborg's science and philosophy flow down into the lifeless concepts and categories of other systems and thus enable him to perceive and refute their errors. To resort to the opposite method in the study of the History of Philosophy is, in reality, practically resorting to a method corresponding to Physical Influx, which Swedenborg not only declares to be untenable, but also to be productive of spiritual death—as can be shown by many statements in the Writings.

This brings us face to face with this whole matter and in this connection I should like to consider the man Swedenborg as a scientist and philosopher and to inquire how far the doctrine of Forms may be of use to us in such a study.

One of Swedenborg's most suggestive generalizations, reminding us of similar statements of Heraclitus of old, is to be found in one of his earliest treatises,—TREMULATIONS,—where he says,—“Life consists in *motion*, but death in *Rest*. Rest can never have any part in that which is called Life.” It might be pertinently asked, whether in a certain way the above quotation does not describe the present attitude of a large number of the New Church of to-day—especially among the members of the Clergy. A desire to maintain a condition of *rest*—to enjoy freedom from all that shall disturb and pos-

sibly modify the commonly accepted opinions of Swedenborg and his philosophy inherited and handed down from our ancestors. Is it not about time for us to lay aside the concepts of the childhood of the Church and to consider those suited to its state of adolescence and manhood?

It has become a matter of common parlance among New Church people to claim that, in his scientific studies, Swedenborg has anticipated many, if not all, of the conclusions and discoveries of modern scientific research. "Evidence committees" have been established to cull from all sources every mention or allusion to Swedenborg and from these to posit a gradual recognition of his place in the world of science. But the strange and incomprehensible thing about all this is that every suggestion to incorporate and utilize Swedenborg's Science and Philosophy into a distinct educational system to serve as a preparatory basis for a more interior understanding of his theology is at once met with a strong attitude of hostility! The thought persistently forces itself on my mind that, in its depreciation of those wonderful scientific and philosophical generalizations of Swedenborg and in its willing acceptance in their place of the tentative and oftentimes irrational conclusions of our present day science and philosophy, the New Church is assuming an attitude and adopting a method in every way similar to that of the Higher Critics in their depreciation of the authenticity and divinity of the Word and of the Lord Jesus Christ. And all this—notwithstanding the oft repeated statements of Swedenborg, that from his youth he was under the guidance and instruction of the Divine Providence, and that he undertook his scientific and philosophical studies, not of his own will, but that he thereby might be educated and prepared, through the inspiration of the Lord, to correlate Natural and Spiritual truth. Either these statements of his are true or they are the delusions of an insane mind—there is no middle position to be held concerning this wonderful man.

The mere fact that Profs. BARRETT and LODGE were chosen to write introductions to the *PRINCIPIA* and *DIVINE LOVE AND WISDOM*, respectively, tells its own story of the whole situation.



It calls to mind what the late Prof. SHALER once said to me when discussing the question of Swedenborg's relation to modern science. These were his words, as I recall them—"I admire and love dear old Swedenborg, but there is absolutely no relation between his science and modern science."

The true test of any philosophic system is its Concept of the Absolute. Now to every Newchurchman the Absolute is the Divine Humanity of the Lord—all other systems of philosophy, therefore, no matter how enticing they may seem, must be regarded as the products of a highly trained natural-rational mind. It is all very well for EUCKEN to tell us of the Universal Spiritual Life; for BERGSON to posit Life as the only reality and seek to trace its flow in Creative Evolution; for SIR OLIVER LODGE to say a good word for Swedenborg in his introduction to DIVINE LOVE AND WISDOM,—but, so far as my study of the serious concepts of these men goes, I have failed to find any recognition of the Divinity of the Lord Jesus. How then, pray tell, can such men teach true Spirituality, or be competent to form any estimate of Swedenborg's Writings?

Let us face this matter fairly and frankly. Is it not, perhaps, the natural-rational degree of the mind that would classify Swedenborg the scientist and philosopher with other philosophers,—asserting that he was "behind the times"—that he knew nothing of the marvellous results of modern scientific research, etc. Such statements have been made to me time and again by strong Newchurchmen. There is an evident fear lest, if we grant a definite correlation of his philosophy and theology, we come back to the days of Authority in the Church,—or that our rational liberty will be thereby impaired. Now there is *liberty* of the rational and *freedom* of the understanding—the one natural, the other spiritual freedom—and the mind is truly rational only when the liberty of the natural-rational reacts *with* not *against*—hence corresponds with—the freedom of the Spiritual Understanding.

In number 273 of MR. ACTON'S translation of Forms we find that, in order to understand the generation of one form from another, it is necessary to hold the idea of the Existence of superior forms within inferior. If we bear this teaching in

mind—positing as the inmost or superior form the unconscious inflow of the divine influx from the Divine Humanity of the Lord into Swedenborg's mind—from the very start each system of natural truths was perfected according to order and degree—most perfect for its place, imperfect when compared with the superior stages. Thus we see that, by means of this orderly reception of an *à priori* influx of truth from the Divine Human of the Lord, Swedenborg at last became, as it were, a man-angel,—standing, so to speak, with his feet on the earth and with his thoroughly and orderly trained natural-rational mind in the spiritual world. So that by this means an orderly influx of Divine truth from the Lord, alluded to in *ARCANA CÆLESTIA* 3702, was at last restored. Hence by means of the doctrine of Forms we are enabled to establish the exact relation this wonderfully prepared man bore to the Lord's second Advent, and of his philosophy to his theology. We shall perceive how, from this duplex life, he was able to trace the course of the Divine Influx from its Source in the Spiritual Sun down through stage after stage till it at last rested or terminated in the ultimates of the natural world and, at the same time, by means of his rational faculty perfected and trained by his scientific and philosophic studies, to give a rational interpretation and explanation of each stage in the modification and reception of the downward course of the Divine influx. Can we fail then to recognize the unique place Swedenborg held in the Second Coming of the Lord? Is it not evident that during those thirty or more years devoted to science and philosophy the Lord was preparing and perfecting a truly natural rational mind—the seat of the liberty of the natural will? At the close of his treatise on the *DIVINE WISDOM* Swedenborg says:

Man from that freedom, broke continuity in himself; and this being broken, separation was effected, and the continuity which from creation was in him became as a chain, or a linked work, which falls to pieces through the breaking and plucking asunder of links above.

This remarkable passage read in conjunction with *ARCANA CÆLESTIA* 3702, and illustrated and interpreted by the doctrine of Forms, must clearly indicate that in the man Swedenborg



order was again restored. Moreover we shall come to understand the discontinuous correlation of the Word as the ultimate basis and continent of the Divine Human—and the Writings as the ultimate basis and continent of the Divine Truth proceeding from the Divine Human into the truly rational mind of Swedenborg as a Divinely prepared instrument; therefore their perfect discreteness will thus be established.

To summarize: The man Swedenborg holds a unique place in the development of the human race as having been the only truly natural-rational and spiritual mind since Creation. Hence we cannot speak of his science, philosophy and theology without the accompanying concept that, taken as a whole, they constitute a system of theology of three discontinuous stages of development. Each lower having been, as it were, the matrix of the next successive; but through them all, like the silken thread of Ariadne, is present the influx of the Divine truth, as a formative soul, received, modified and adapted according to the particular needs of each stage of Swedenborg's preparation.

It follows, therefore, as a corollary that without this broad concept of the Writings, no commentator, no translator, can hope to express or interpret the deepest and most interior sense of the Writings. The doctrine of Forms will show that even certain words which Swedenborg uses must be considered according to their various degrees.

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## CHARLES' LAW IN ITS RELATION TO SWEDENBORG'S BULLULAR HYPOTHESIS.

BY WILFRED HOWARD.

Charles, a Frenchman, in 1787, discovered that the pressure coefficients of all gases are the same,—namely, that all gases if heated one degree centigrade expand one 273d of their volume. From this law, we have the conception of absolute zero, which supposes that at minus 273 degrees gases would reach zero volume, though as a fact, all gases become liquids before reaching the zero mark of absolute temperature. The

law is sometimes stated as follows: The pressure remaining the same, the volume of the gas varies directly as the absolute temperature. Related to this law we have Boyle's law, that the volume of any gas varies inversely as the pressure. This remarkable regularity in the action of all gases was explained by Avagardo in 1811 in what is now known as Avagardo's hypothesis, which states that equal volumes of gases, under like conditions of temperature and pressure, contain the same number of molecules. As temperature, heat, is involved in all these laws, a brief review of the theories of heat may be useful here.

There are two theories as to the cause of heat, the theory of emission, and the theory of undulation. The theory of emission supposes heat to be caused by a subtle and ponderable fluid which surrounds and penetrates all substances; this fluid is sometimes spoken of as heat-atmosphere, which surrounds the molecules and exerts a repelling influence on each molecule, thus acting in opposition to the force of cohesion. The theory of undulation supposes that the heat of a body is caused by the rapid oscillation or vibration of its particles, and that the hotter the body, the greater the amplitude of the vibrations of the heated body. According to this hypothesis, heat is not a substance, but a condition of matter. The theory of undulation is also called the dynamical or mechanical theory. Tyn-dall says, in *HEAT, A MODE OF MOTION*, (p. 39), "The dynamical theory, or as it is sometimes called, mechanical theory of heat, discards the idea of materiality as applied to heat; the supporters of this theory do not believe heat to be matter, but an accident or condition of matter; namely, a motion of its ultimate particles." Preston, in *THE THEORY OF HEAT*, in support of the dynamical or wave theory, says (page 53), "Heat then, like light, is supposed to be due to wave motion in the ether. We say that the molecules of a hot body are in a state of very rapid vibration, or rather, are centres of very rapid periodic disturbances of some sort; that they thus excite waves in the ambient ether; that these waves travel through the ether between us and the body with the velocity of light, and that when they fall upon us they are



more or less absorbed by, and cause corresponding motions in, the molecules of our bodies, and thus arises the feeling of hotness. The sense of heat in us is thus excited by the ethereal waves diverging from the hot body." The dynamical theory supported by Preston, seems to have gained universal acceptance at the present day.

Turning to Swedenborg's theory of heat, it may be briefly stated as, That heat is an undulation or local motion of the third aura or the ether. In the *PRINCIPIA*, Part III, Chapter 5, n. 21, he says: "The central motion of the particles of the ether causes not only a rigid expansion of every particle, but also heat." "Heat is thus defined by Swedenborg (says Miss Lilian Beekman) as a tense rotary motion or volution of the interior volume of the finer ether existent in a molecule of luminiferous ether, or the air, which is attended by a more or less rapid and great extension of the entire molecule. (*Spectrum Analysis*, p. 15; see also *Princ.*, Part III, Chap. 8, n. 10.)

Having briefly considered the subject of heat, we may now turn to the next consideration involved in Charles' Law, namely, the molecular composition of gases, or Swedenborg's bullular hypothesis. In our conception of gases, are we to consider a gas as a mere massing of least substances or atomic particles? or are we to picture it,—in the light of Swedenborg's bullular hypothesis,—as a sphere of substance composed of an active centre of subtle ether surrounded by an envelope of atomic particles? the differentiation of gases one from another, and the difference of atomic weights of gases being due to a difference of the particles or corpuscles composing the gas. Modern science is rapidly drifting to a conception of matter somewhat similar to Swedenborg's bullular hypothesis. The electron theory, as an instance, supposes matter to consist of minute spheres of negative electrified corpuscles balanced or kept in equilibrium by a number of positively electrified corpuscles. This widely accepted theory is essentially bullular in its conception.

Accepting therefore Swedenborg's theory of heat, as essentially an ether phenomenon, or as stating that the prime and

essential cause of all temperature changes is due to the presence and change of the interfluent ether, and not to substance *per se*; accepting also Swedenborg's bullular hypothesis and its application to gases, let us now view the relation of these two principles to Charles' Law.

Gases, because they occupy space, come under the general definition of matter. Almost all gases can be made to assume three different physical states, the solid, the liquid, and the gaseous, but it is only when the gaseous state is reached that the phenomenon of equal expansion takes place. For instance, the coefficient of expansion is by no means similar in the case of liquid hydrogen and liquid oxygen; but let them return to their gaseous state, and at once Charles' law of equal expansion becomes operative. The molecules of all chemical substances are made of volumes of angular particles with volumes of ether bullæ. The angular particles give weight, and ponderability; the bound-in volumes of ether possess no weight, they occupy space, they give active force to the molecular structure. All the heat the matter possesses, or is able to possess, resides in, and is the gift of the ether volume; whilst its atomic weight resides in the volume of inert, angular particles.

Now, picturing a gas as matter in a free state, which is the generally accepted theory, or as matter, which, because of the freedom of its parts, finites, or molecules, is able to be freely formed by the subtle ether into bullular particles essentially possessing the characteristics of a gas, namely, mobility, elasticity, freedom of expansion and contraction,—and assuming that the same subtle ether, the third aura, composes the active centres of all gases,—to which ether all heat phenomena are due; and assuming further that the difference of gases one from another is due to their angular particles, the surrounding envelopes, which give to them their difference of atomic weight; then perhaps the causes of the phenomena of Charles' law of equal expansion may begin to be revealed to us. For all gases being formed by the moulding influence of the same ether; and the ether being in a relatively free state, in no sense bound in, as is the case with liquids and solids, and therefore



in a state of perfect freedom of expansion,—it would seem to follow that a rise of temperature of one degree Centigrade, would act with equal expansive power on all gases. For the matters, finites or particles being in a perfectly free state, would in no case be able to retain the expansive power of the ether, as they can when associated in the relatively less free states of liquids and solids. By the application of Swedenborg's theory of heat and bullular construction, we have, I think, at least, a suggestion of the causes that underlie Charles' Law.

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## PHYSIOLOGICAL PAPERS.

BY LILIAN G. BEEKMAN.

### THE OFFICES OF NUTRITION.—(*Continued.*)

CERTAIN PRACTICAL LAWS OF THE SELF MODIFICATION OF GROW-  
ING ORGANIC RECIPIENTS AND OF THE USES OF  
NUTRITIVE SPHERES THERETO.

An animal is one kind of an animal all its days; but the human animus, the common animal plane of man can act, can be, a hundred kinds of animals in an hour. Everyone of these changing states of inclination and impulse acts its quality, through its fibres, into and from the end organ of the fibre. If that end organ is in a muscle it stamps the moral and physical quality on the muscle; if the fibre goes to the cells of a secreting gland, the secretion or the lymph produced from that incitation of the animus bears the very inclination and potency of its state,—and this actually as a plastic life-formative seminal principle effective to reproduce its kind (*A. K.* 183, note 1). If the fibre goes to one of the sipping cell-mouths which absorb nutrition from the chyle, or which, in the lungs or skin, imbibe finer foods,—aerial, etherial,—the osmotic action of the cells is qualified and governed to a selective absorption of particles strictly congenial and allied to the quality of the state of the mind and its fibres. For every one of these changing states of the human mind acts its quality through fibres; and every state elicits and draws forth from the com-

mon food supply those inert nutritive particles which are as its own consorts. These particles, moreover, rising to the brain and transferred to the heart of the cortical gland, not only nourish, but encourage that state which first called for and imbibed them, kindling its desires, increasing its heats, and being capable of exciting intuitions, perceptions, persuasions that are consort and correspondent to the quality of their own inmost substance and form. Hence odors, spheres, effluvia, and the drawing of them into a living organism, are the correspondents of perceptions, and actually have to do with perceptions,—the perceptions of the mind in delight, and the effluvial emanations thus drawn in, acting one cause.

Moreover, the quality of the angular particles, whether nutrient or poisonous,—both those which the sera of the bloods carry and those which lend themselves to the compounding of the globules of those bloods,—has a practical actual power of controlling which degrees of the mind shall be opened or closed. The approach and touch of evil substances closes the interiors of the mind and opens the exteriors pertaining to the body; and minds or men of whom this has been true during natural life, after death still adjoin themselves to the like substances and spheres (*A. E.* 1057, 659) which are, as it were, the atmospheres in which they live (*S. D.* 3817).

Along these laws of order and action belonging to the structure, growth and individual modification of the organic basis of life, we see the substantial working ground of the statement that when a man rejects an evil from himself in ultimates he also rejects the lusts for it (*A. R.* 678); for evil exhalations or substances in the blood and evil lusts and thoughts act in consort (*A. C.* 4227; *S. D.* 1808).

Moreover, as already noted, every part of an integral form,—interior and exterior,—by its processes of perpetual solution and reparation, is perpetually sending forth a radio-emanant sphere of least particles, framed to its specific characteristic form and conatus; a sphere which is to be practically reckoned with, and will be, so long as its quality exists, that is, its very form. You cannot bring forth figs from thistles; cockatrices' eggs never hatch doves. The spheres of evil things, false



imagination and active evil thought,—poisonous, waste and foul,—never comply with or are builded into good forms; nor the particles of the spheres of good forms into evil. Hence it is that the Divine Proceeding is very careful by all ordered means to keep the blood of a man's heart and his purer blood or animal spirit in strict correspondence as to purity or defilement with the marriage of love and wisdom, or of evil and falsity in that man,—and this from moment to moment. And by this means the Lord in ultimates of primitive particles governs his states, his moods, his impulses, his delights, and the changing providence of the inner series of his life, without the man being aware thereof.

Certain things of practical import are involved in the operation of these rules which like good rules measure the same both ways, and are to be counted on and used for health, attainment, self-modification, both for the calling forth and the establishment of a life, desires and affections in consonance with the will of wisdom, and for the fighting against and elimination of evil or undesired affections.

Three laws give us the key and the power :

FIRST. The delights and desires of the animus vary in quality with this variation of the nutrient spheres, which are borne in the serum of the blood, or carried in the blood globule.

SECOND. The self-determined images and thoughts which the animus holds and returns to,—refraining from other ones soliciting,—are strictly repeated, as to their quality and as to all their powers, in the downgoing activities of the fibres and in the ultimate actions of the end-organs of these fibres. Thus, among other effects of such self-determination and the holding of imaginative images and deep ideas of thought, will be eventually that of eliciting and imbibing the substantial nutrient particles consort to such images and thoughts; and of rejecting all that disagree. For the animus is the general sensorium, the organic ground of sense and imaginative images, and the natural memory. This general sensorium is *our* inmost,—that which is inmost of this being the Lord's, not ours. In this general sensorium, as in its very body and members, is our understanding, the great intermediate mind of human volition

and sensitive intelligence (*A. K.* 565). This animus, according to its nature, determines the nature of the chyle, hence of the blood and of the body.

For man has a rational mind given to him that he may check or repress the lusts of the body, and moderate and assuage their fires; for if the chyle be tempered according to all the affections of the animus, and if those affections be kept under the government of the rational mind, then it follows that the chyle in this manner is also kept under its auspices (*A. K.* 155, note g).

And such as is the quality and nature of the chyle called for by the animus, such are the states, the ideas, principles and thoughts, in the imaginative and memory-mind which thus receive nourishment, sustainment, accretion, infilling of form, incitement, heat, encouragement. For the nutritive particles, whether of foods or spheres (*A. K.* 519, note m), according to their own specific quality and force, and their spiritual affiliations and connections for good or for evil, always feed, nourish and encourage the complementary states, ideas, principles, recollections, sense-images, delights, in the common sensory or animus of the cerebrum, in order that we ourselves may fashion that innermost of us, in the formation of which we are voluntary and intelligent co-working partners with the Lord. For the intermediate human mind, the sensory understanding proprial mind, as it grows during the course of life,—as it is held in repeated thought and state and desire,—reaches out by its fibre to get such chyle and serum-particles as will swell that thought or state and sustain the flame of that desire.

Every fibre carries with it, wherever it goes, the animus or affection of its parent cerebrum or cerebellum. . . . The mesenteric fibres, thus animated by the brain, are what command and cause the delicate mouths of the lacteals, to seize with avidity whatever things are desired, and to reject with loathing whatever are disliked. . . . Thus from the stores of the stomach and intestines, likewise from the stores of the blood and serum, and from other repositories, the innermost mind evokes and extracts whatever essences and chyles it intends or wants, and feeds thereon, and nourishes the flame of its desires. . . .

The nature of the animus determines the nature of the chyle, consequently of the blood, and ultimately the state of the body. In fact,



by the quality of the chyle, that is to say, of the humor which flows into the vessels, the animus is not only fed but encouraged (*A. K.* 156-157 and note 1).

So long as we are governed by the will, and the will itself is tossed by the desires of the mind and the lusts of the animus, so long a pure stream cannot possibly be absorbed by the little veins, but whatever favors and corresponds to the ruling principle of the animus, will be carried into the blood,—in anger, for instance, black bile, and broken pieces, or quantities of serum and blood (*A. K.* 405, note b,—first note).

THIRD. The human mind has power to determine its images and its acts, even against exterior sollicitation of other images, or interior incitations of desires (*A. E.* 1151). We shall return to this law presently, when we come to speak of the freedom of the intermediate mind. We note here, however, that it follows from this law that repeated determinate attention and effort, even against the incitation of the affections of the heart at the time, will surely at last elicit into the bloods and their sera, the nutrient spheres which will excite consort and concordant affections and delights of the very heart, and, please God, of the very soul.

Other things open: Wherever homogeneous exhalations are present in nature, there is the plastic or passive force of the spiritual present and operative, and ready to co-act, to be mated with the active power of the Divine Proceeding embodied and operative throughout the universe in the four auras or atmospheres; that they may serve in their place and time for the production of new organic forms recipient of influx, coacting to the Divine. "In everything spiritual there is a plastic force wherever homogeneous exhalations in nature are at hand" (*A. E.* 1201). Hence the sphere given forth by the activities of a lower plane of the mind may be a good, a mother-substance, so homogeneous to the influx of higher degrees that there the spiritual, the celestial, is present with plastic force to bring forth, as it were, a very form of truth, for the bodily growth of the mind itself. Thus it is that minds grow actually after birth. Thus it is that they are infilled and made firm in their principles, their thoughts, their growing perceptions. Or it may happily be that the sphere of another human being may bring that eternal and celestial chyle which the

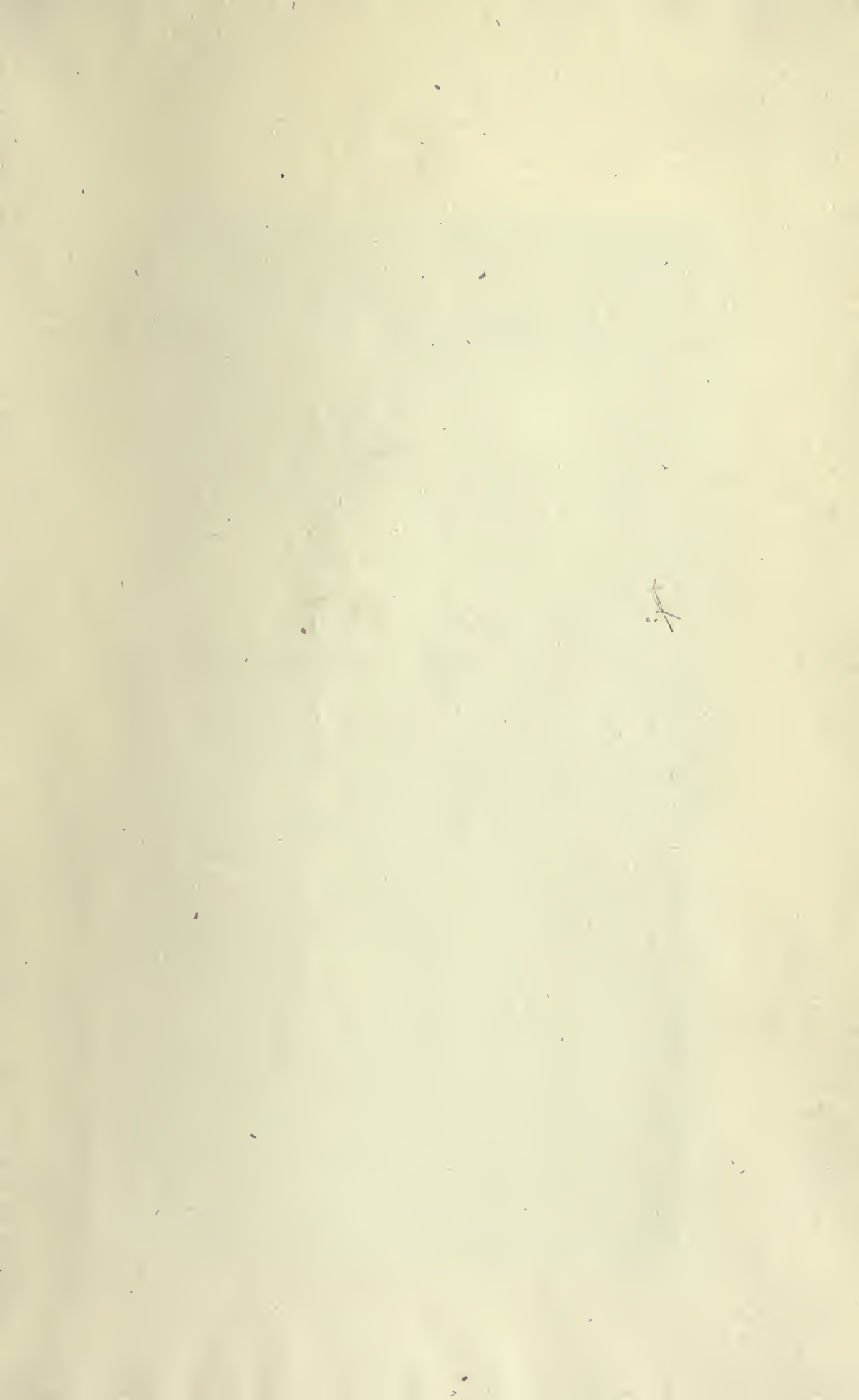
thought of the deepest meditation needs, that the Divine, present in the mind, touching it to ineffable intuitions and momentary motions, may take therefrom an infilling sphere to frame their fuller bodies, or more constant force and ultimating powers. Thus a man or a woman may be indebted to another woman or man for gifts emulating the good gifts which the Divine Good gives its creation. Or the converse may be the case; and from the effluvia given off by evil forms, creations of hell may body forth, bringing into the world new poisons and ill thoughts, false images and ill affections. Nay, swiftly as a breath, evil states of fear may change the milk of a mother's breast into malignity, or the bite of an enraged man may carry the living plasma of unforeseen ills (*A. K.* 71, note 1; *Fibre* 540).

It is thus that we are besieged by the subtlest hells,—those of hell's heart kingdom; and the mind realizes that the organic frame is pressed upon and surrounded by the hells as by the heavens. Moreover, one perceives how the hells could come near and assail our Lord in stuffs of blood and chyle; perceive too the significance of the saying about our Lord's fasting; even a new significance in the warning to Swedenborg as to unseemly use of food (1 *Doc.* 35).

Yet this plastic assailing potency of evilly organized substances and spheres is circumscribed, and but mimics heaven. If we put the ill away, working in ultimates together with the Lord to that end, He works with us in primes and in ultimates at once (*Div. Prov.* 24), to heal and empower both mind and body, thus purifying blood and heart, as well as the mind, and enhancing love's flame which burns up to God as from a lamp fed with pure oil, giving happy radiances of truth on every side.

(*To be continued.*)









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